THE IRON TRADE REVIEW

Volume LVII Cleveland, July 1, 1915 *No. 1*

Volume of Shipments Increasing

And Additions Are Being Made to Active Plant Capacity— Heavy Foreign Demand Continues

The reality of the improvement in business is shown not only by the large volume of inquiries and by the general tendency toward higher prices, but also by very heavy shipments and by the steady increase of activities in manufacturing plants. While orders connected with the European war are still an important factor, there is encouraging increase in domestic demand. For example, in sheets, buying of automobile manufacturers has been very heavy and last week the American Sheet & Tin Plate Co. enjoyed the largest volume of business in two years. Many warehouses selling a large variety of products report that the slow, but steady improvement of preceding months was continued during June. Leading companies are expected to announce very soon another advance of $1 per ton on plates, shapes and bars.

Shapes

Among the most important contracts for structural material awarded during the past week were 24,000 tons for the new municipal bridge at St. Louis, to the American Bridge Co., and about 14,000 tons for the Polk street warehouse of the Pennsylvania railroad, at Chicago, to the McClintic-Marshall Co. Awards are more numerous and the general tone of the structural market considerably stronger.

Plates

Four tank ships awarded by the Standard Oil Co. to the New York Ship Building Co. will require from 12,000 to 14,000 tons of shapes and plates, but the vessels are not to be delivered for about two years, owing to the filled up condition of the ship building company. Some irregularity in prices of plates continues, and while 1.25c, Pittsburgh, is the usual quotation for third quarter, sales are being made at 1.15c and 1.20c.

Coke and Scrap

Reports from the Connellsville region indicate that Italians in large numbers are leaving to take part in the war and that there is increasing danger of a shortage in labor. During the past few days, a number of companies have advanced wages of their men, bringing them up to the schedule of the Frick Coke Co. Prices of coke for prompt delivery are stiffening. Quotations on old material are showing an upward tendency after a prolonged period of depression. Some grades have been marked up at Pittsburgh. The market shows improvement at Chicago and elsewhere and steel works in eastern Pennsylvania are buying scrap more freely.

Railroad Buying

Important inquiries for railroad equipment are still pending from foreign countries. Russia is actively negotiating for at least 150,000 tons of steel rails and is also figuring on ordering additional rolling stock. France is in the market for about 100,000 tons of rails and may place an order for 345 passenger coaches. On an inquiry for 10,000 tons of rails for shipment to Australia, bids are to be received July 7. Inquiries for cars for domestic lines aggregate from 5,000 to 10,000.

Machinery

The demand for lathes and other machine tools for the manufacture of munitions is of very large volume. Many companies are looking into the possibility of engaging in the manufacture of shells, but find it very difficult to obtain the necessary equipment for anything like early delivery and buying is not of the large volume that it would be if prompt delivery could be guaranteed. Domestic demand shows some improvement, but orders not connected in any way with the war are rather light.

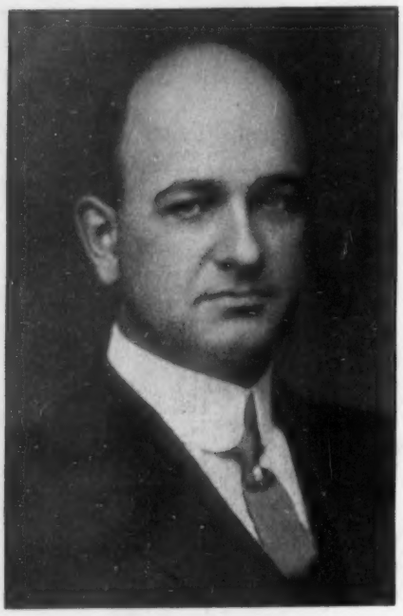
Billets

The increased volume of output of finishing mills is shown by their demand for billets and several companies which usually are sellers may be compelled to buy open hearth billets to meet pressing requirements. The Steel Corporation is understood to be negotiating for a round tonnage. It has not purchased pig iron and coke, as rumored.

MEN OF MACHINERY TRADE

Who they are Where they are What they are doing

A. E. NEWTON, vice president and general manager, Reed-Prentice Co., Worcester, Mass., is one of the most widely known of the younger executives in the machine tool business of New England. Mr. Newton has been associated with the Reed-Prentice Co. and its predecessor, the F. E. Reed Co., for 19 years, during which time he rose from the ranks to the position of authority he now holds. He is a strong believer in association



A. E. NEWTON

work and is active in the affairs of the National Machine Tool Builders' Association, of which he is treasurer.

G. M. Haardt, of Citroen & Cie, Paris, who has been in this country making purchases of machine tools, sailed for France June 1.

Horace R. Wentzell has severed his connection as superintendent of the Bourke Machine Co., Detroit, and has become affiliated in a similar capacity with the Houk Mfg. Co., Buffalo.

J. R. Hussey, for 12 years connected with the Baird Machinery Co., Pittsburgh, now is identified with the Brown & Zortman Machinery Co., also of Pittsburgh. Mr. Hussey is well known in all branches of the machinery trade in the Pittsburgh district.

Foster A. Haist, secretary and treasurer of the Keystone Mfg. Co., mechanics' tools, Buffalo, N. Y., succeeds J. E. MacArthur as factory superintendent.

E. J. Parker, New York representative of the Morgan Engineering Co., Alliance, O., sailed for Europe on June 24, on HELLIG OLAV. He will spend three or four months in Russia.

George Aubrey, of the Fitchburg Machine Works, Fitchburg, Mass., recently sailed for Europe. He will make his headquarters at the Paris office of the Allied Machinery Co. of America.

W. H. Keller, assistant master mechanic of the Baltimore & Ohio Southwestern railroad at Cincinnati, O., has been appointed master mechanic of the Indiana division, with headquarters at Cincinnati.

H. V. Lewis, formerly president H. V. Lewis Co., and now connected with the Allied Machinery Co. of America, New York, has sailed for Europe. He will be attached to the Paris office of the company.

George C. Wilson, Independent Pneumatic Tool Co., Chicago, has been appointed manager of that company's branch at Atlanta, Ga., succeeding F. H. Charbono, transferred to Boston.

M. B. McPartland has been appointed master mechanic of the Colorado and Nebraska divisions of the Chicago, Rock Island & Pacific railroad, with headquarters at Goodland, Kan., succeeding E. F. Tegtmeyer, resigned.

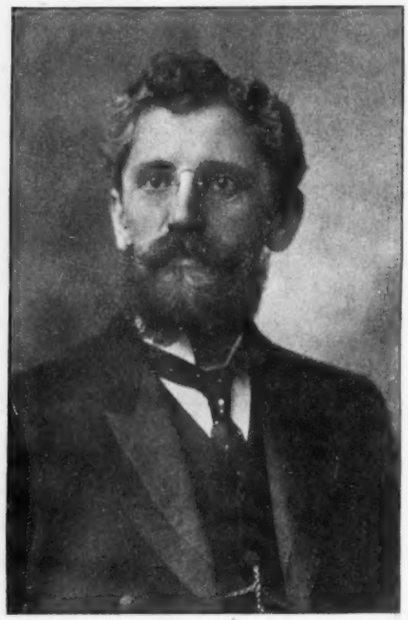
O. P. Reese, master mechanic of the Pennsylvania lines west, with headquarters at Crestline, O., and Pittsburgh, Pa., has been appointed assistant engineer of motive power in the office of general superintendent of motive power, to succeed T. R. Cook, resigned.

At the recent annual meeting of the Machinery Club of the city of New York the following were elected as members of the board of governors to serve four years: W. L. Saunders, A. B. See, W. A. Redding, D. W. Bigoney and W. P. Bowman. Charles Shults was elected to serve two years.

P. Alquist, superintendent of the car department of the Missouri, Kansas & Texas railroad, at Sedalia, Mo., has been appointed general superintendent of the car department with offices at Dennison, Tex. William Walker, general foreman of the Sedalia shops, succeeds Mr. Alquist.

G. E. Sisco, assistant engineer of motive power of the Pennsylvania lines west, at Columbus, O., has been appointed master mechanic, with headquarters at Toledo, O., succeeding J. W. Hopkins, transferred.

Julius Keller, who was for many years in charge of a large manufacturing institution in Philadelphia, has transferred his activities to the west



JULIUS KELLER

and is now president of the Keller Pneumatic Tool Co., Fond du Lac, Wis. For many years he has been acknowledged as one of this country's leading experts on pneumatic tools, being a pioneer in this field. He designed and built some of the earliest chipping and riveting hammers, rammers and drills using compressed air, these being first put on the market about 1890. He has invented many complicated devices and is a thorough master of the design and construction of intricate machinery.

Mr. Keller is the friend and associate of many eminent men. One of his most cherished possessions is a large autographed portrait of Charles M. Schwab that bears this inscription: "To my dear friend, Julius Keller, America's Greatest Mechanic."

Prices Are Now Up Twenty Per Cent

Since the First of Year Advances in Machine Tool Quotations Have Been Steady—War Demand Shows No Slackening

FURTHER advances in prices constituted the feature of leading interest in the machine tool market in June. During the first half of the month, the principal makers of lathes, turret lathes and automatic and hand screw machines raised their quotations by about 10 per cent. Thus, taking into consideration a similar advance effected two months or so ago, prices on these machines are 20 per cent higher, on the average, than they were at the beginning of the year. During the past month, also, the principal makers of milling machines declared advances ranging from 10 to 15 per cent and the makers of heavy duty, high-speed drills followed suit with an advance of approximately 10 per cent. In addition, it was expected that by the early part of July, prices on practically all other machine tools would be increased by 5 per cent or more. The makers claim a higher cost of manufacturing accounts for these advances. Of late, a great many machine tool manufacturers materially have advanced the wages of their mechanics; these advances, in some cases, were granted entirely voluntarily to the men. In addition, the manufacturers, in a majority of cases, are operating their plants overtime and with night shifts, paying more than the usual wages for time extending beyond the regular working hours.

The demand for machine tools suitable for making shells and other munitions of war continued active all through the month. The amount of business actually transacted was considerably smaller in volume than in previous months, this being due to the impossibility of getting nearby deliveries on the tools most in demand. Manufacturers of all kinds of lathes and screw machines in all cases are sold up on the greater part of their production over the remainder of 1915 and some already have contracted for deliveries early in 1916. Dealers continued to scour their territories for second-hand lathes and screw machines and all the equipment of this kind they managed to secure they turned over at a big profit without delay. Demand during the month was active, both from domestic manufacturers engaged or about to engage on war contracts, and from abroad, and was particularly active toward the close. Of the foreign countries Russia appeared to be the biggest buyer, while England and France also purchased on a large scale. In addition, there was a fairly active demand from Italy, and some from Spain and Sweden.

More Tools for Remington

THE biggest domestic war buyer during the month was the Remington Arms-Union Metallic Cartridge Co., Bridgeport, Conn., which closed for the complete equipment for the new plant which the Baldwin Locomotive Works is completing at Eddystone, Pa. This is to be the biggest rifle-making plant in the country, and is to operate on contracts secured by the Remington interests. Large quantities of equipment for making war munitions were bought also by the American Locomotive Co., the Nathan Mfg. Co., New York; the American Machine & Foundry Co., Brooklyn; the Standard Steel Car Co., the E. W. Bliss Co., Brooklyn; the Bethlehem Steel Co., the General Electric Co., the Crucible Steel Co. of America, the American Car & Foundry Co., and many other concerns. Among concerns which were figuring on equipment to make shells and other war munitions were the International Steam Pump Co., the Railway Steel Spring Co., the Collingwood Ship Building Co., Toronto, Can.; the Crocker-Wheeler Co., Ampere, N. J.; American Steel Foundries, William Wharton Jr. & Co., Philadelphia; the Cayuta Mfg. Co., Sayre, Pa.; the Lea-Courtenay Co., New York; the American Brake Shoe & Foundry Co., the Scullin-Gallagher Iron & Steel Co., St. Louis; the E. J. Codd Co., Baltimore; the Columbia Machine Works & Malleable Iron Co., Brooklyn, and a host of others.

Domestic Demand Spotty

DOMESTIC demand, of a character other than that originating in the war, reflected considerable improvement, particularly in the east and in the Pittsburgh district, in which sections the improvement appeared to be more pronounced than in the middle west and western sections. At the same time, it is generally admitted that the volume everywhere was not up to normal. Certain industries were much more active buyers than others; the automobile and automobile accessory manufacturers, for instance, were good purchasers. The manufacturers of ball bearings also were heavy buyers. On the other hand, with a few exceptions, the railroads continued to stay out of the market. The Santa Fe closed on a few lathes, but withdrew the remainder of its list, a step which is said to have resulted from the recent advances in prices. The Burlington is understood to be holding up its expected purchases for the same reason. The North-Western purchased a rail-cutting plant, and the Rock Island made some minor purchases. Authorities on the railroad situation believe that little improvement in the volume of buying by these interests will develop for some time to come; this view is based, in part, on the sentiment prevailing at the railway conventions, which were held in Atlantic City during the past month.

Crane Builders Busy

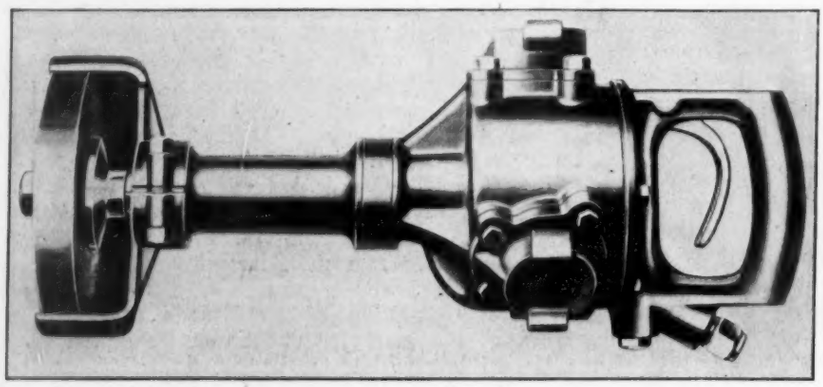
DEMAND for cranes showed a marked improvement; in addition to some good-sized lettings, the new inquiries which came out formed a volume of pending business which is the largest before the trade at any single time within a year. As a result of recent bookings, at least a few crane plants are busy, which is a condition the crane builders have not experienced for a long time past. Demand for rolling mill equipment showed improvement. The Youngstown Sheet & Tube Co. awarded contracts to the Morgan Construction Co., Worcester, Mass., for one 9-inch continuous mill, one 12-inch continuous mill and a combination 14-inch and 18-inch continuous mill. The Carnegie Steel Co. and other concerns aided in swelling the volume of business in steel plant equipment. The Pennsylvania railroad signified its intention of taking bids shortly on the construction of a new coal-loading plant at Canton, Md.

New Portable Grinder

A portable pneumatic grinding machine recently has been introduced by the Ingersoll-Rand Co., New York. This tool has a number of novel features and was designed with special reference to simplicity and accessibility.

The motor is the three-cylinder type. The connecting rods are of one-piece construction, fitted to the crank shaft on roller bearings. The crank shaft and spindle are a one-piece forging, which runs on a triple ball bearing, one bearing being used in the front end of the main body of the casing and two bearings on the end of the spindle. All parts are enclosed in a dustproof case and operate in a bath of oil.

To simplify operation, the valve construction is of the rotating type, is made a part of the crank shaft, and works in a renewable bronze bushing. No gears or pinions are used.



PORTABLE PNEUMATIC GRINDING MACHINE

The entire operating mechanism is readily accessible, the loosening of six cap screws removing the handle and exposing the interior for examination. The cylinders are interchangeable and can be replaced without renewing the main body of the casing. As shown in the accompanying illustration, the cylinders are provided with lugs to take care of the wear on exposed corners.

The grinder is rated to operate up to an 8-inch diameter emery wheel at a speed of 3,400 revolutions per minute. This machine is specially designed for grinding, buffing, polishing or cleaning castings.

Several changes have been made in the prominent San Francisco machinery house of Harron, Rickard & McCone. H. L. Terwilliger has resigned the presidency to take the management of the San Francisco office of the Ingersoll-Rand Co., but will make his headquarters in the Harron, Rickard & McCone building, that house continuing to carry a stock of Ingersoll-Rand machinery. H. G. Mitchell, formerly secretary, is now president of Harron, Rickard & McCone, whose building is being extensively altered, with the installation of improved facilities for displaying machinery.

Personals

W. H. Hegmann has tendered his resignation effective July 15 as superintendent of the Braeburn Steel Co., Braeburn, Pa. He will be located at Dunkirk, N. Y., after July 15 with the Atlas Crucible Steel Co.

Charles B. McElhany, general sales manager of the Cambria Steel Co., has been elected vice president of the company, to fill the vacancy caused by the recent resignation of J. L. Replogle. Mr. McElhany's headquarters are at Philadelphia.

E. M. Herr, president of the Westinghouse Air Brake Co., received an honorary degree of Master of Arts from Yale at commencement exercises, June 23.

J. A. Camm, Kearney & Trecker Co., Milwaukee, was in New York City last week, closing contracts for a large number of milling machines for foreign shipment.

H. C. Crawford has been appointed successor to William A. Sproull as traffic manager of the Cambria Steel Co. Mr. Crawford will be located at Philadelphia.

J. B. McKennan has been appointed general manager of the Colorado Fuel & Iron Co., Denver, Colo., with offices at Pueblo, and F. E. Parks has been made manager of the Minnequa works of the company.

Ira C. Rogers has been made general purchasing agent of the International Steam Pump Co., with headquarters at 115 Broadway, New York City. He was formerly assistant purchasing agent of the Pittsburgh & Lake Erie railroad.

Andrew Fletcher, of the W. & A. Fletcher Co., Hoboken, N. J., has been elected a director of the Wm. Cramp & Sons Ship & Engine Building Co., Philadelphia. Mr. Fletcher also is a director of the American Locomotive Co.

Norman S. Powell has been appointed superintendent of the open hearth department at the North works of the Carnegie Steel Co., at Sharon, Pa. Mr. Powell formerly was assistant superintendent of the open hearth department of the South works of the company.

E. H. Gary, chairman of the United States Steel Corporation, has left for a two months' trip to California and other western points. Judge Gary usually has spent his vacation abroad, but has been prevented doing so this year by the European war.

Andrew Carnegie is at Bar Harbor, Me., for the summer resting after an attack of grip. A report that Mr. Carnegie is seriously ill is discredited by his physician, who declares that the iron master's health for one of his years, is very good.

Wadill Catchings, president of the Central Foundry Co., New York, has become associated with J. P. Morgan & Co., as assistant to E. R. Stettinius, who has charge of the firm's export department and is superintending large purchases of war supplies. Mr. Catchings retains the presidency of the Central Foundry Co.

A. H. Zirckle, connected with the traffic department of the Pittsburgh Steel Co., Pittsburgh, has been appointed manager of the recently organized traffic department of the Pittsburgh Steel Products Co., a subsidiary of the Pittsburgh Steel Co. Mr. Zirckle at one time was connected with the Columbia Steel & Shafting Co., Pittsburgh, at its Rankin, Pa., works.

David A. Thomas, a prominent Welsh coal magnate, has been sent to this country by David Lloyd George, the minister of munitions of Great Britain, to look after the filling of ammunition contracts in this country and Canada. It is announced that he will co-operate with J. P. Morgan & Co., of New York, who are acting as purchasing agents for the British government.

J. A. Massel, a special agent of the department of commerce who has been investigating the markets for machinery and machine tools in South America, has returned to this country. He expresses himself as highly gratified over the trade possibilities in the countries visited and over the reception accorded him, especially in Argentine and Chile. Mr. Massel expects to make another trip to South America in the near future.

Engine Lathe for Machining Projectiles

The Bridgeford Machine Tool Works, Rochester, N. Y., recently has equipped its 32-inch triple geared head engine lathe with special devices to permit rapid turning and boring of large shells. On a 32-inch diameter, the lathe delivers a pulling power of approximately 17,800 pounds at the tool.

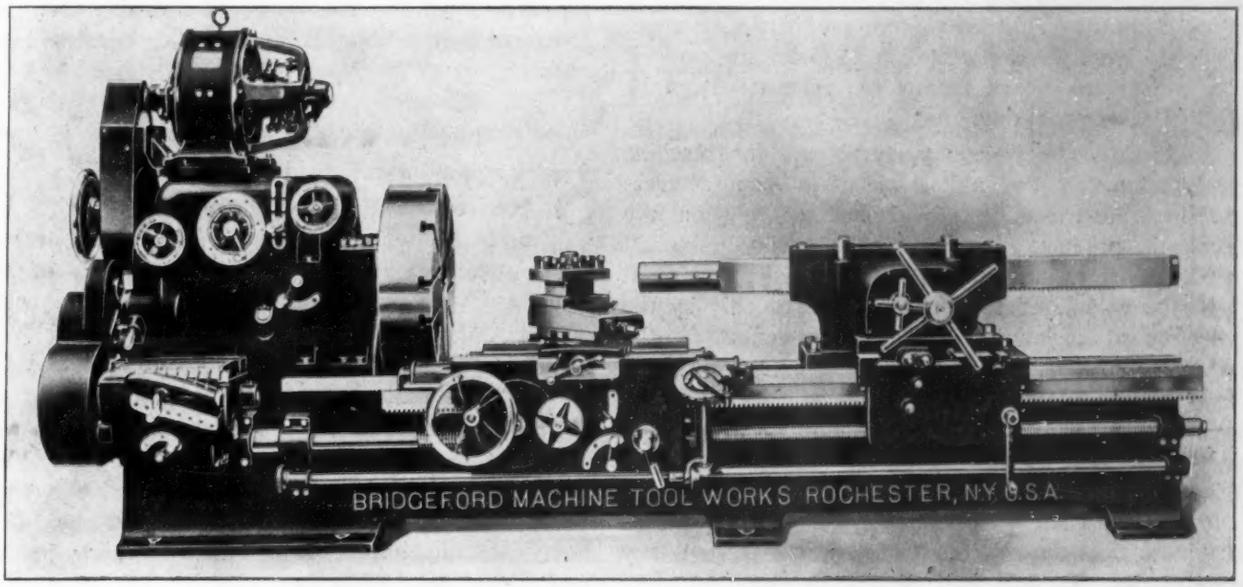
A power-fed tail block of heavy construction, as shown in the accompanying illustration, is supplied to facilitate the boring of large shells. The bar is 5½ inches in diameter, and is bored and reamed for a No. 7 Morse taper. It is arranged on a swivel so that either straight or taper holes can be bored without using the taper attachment.

The power for operating the bar is taken from the lead screw and transmitted through gearing. In addition, the bar can be traversed by hand at any speed desired by the operator. The large hand-wheel has two positions, one for fast movement and the other through back gears. The small handwheel is for engaging or disengaging the power feed. The tail block has cross adjustment, and there is lateral adjustment along the bed. A four-tool, steel turret is provided on the compound rest.

The lathe is driven by an 18-horsepower Westinghouse variable speed motor and is controlled from the carriage by a drum type controller, located on the rear of the frame. This arrangement enables the operator to change speeds without leaving his position at the carriage.

Without a motor, the head block gives 15 mechanical speed changes in geometric progression. When the lathe is equipped for motor drive, these 15 speeds are multiplied by as many points as are on the controller.

The quick change gear box enables the operator to obtain any desired feed readily. In operation, the lathe usually is equipped with side turning or full swing rests.



ENGINE LATHE EQUIPPED FOR TURNING LARGE SHELLS

Export Company

Will Handle Products of Cambria and Other Concerns

A new export department for the exclusive handling of the increasing foreign trade of the Cambria Steel Co. has been formed under the name of the American Steel Export Co. The operations of this department will not be confined to the marketing of the products of the Cambria Steel Co., but also will include the handling of the wares of other American manufacturers. A number of agencies already have been established abroad. The officers of the new company are as follows: President, W. H. Donner; first vice president, C. B. McElhany; second vice president, W. S. Ottinger; treasurer, D. Brewer Gehly; comptroller, H. W. McAteer, and general manager of sales, Otto Kafka. The general offices will be in connection with the headquarters of the Cambria Steel Co. in the Morris building, Philadelphia.

Will Sell Pig Iron and Coke

Cincinnati, June 30. — The Reliance Iron & Coke Co., Cincinnati, which was recently incorporated with a capital stock of $25,000, to do a general brokerage business in pig iron, coke and alloys, has established offices at 815 Union Trust building, that city. The company is a branch of the Reliance Coal & Coke Co., but will be operated as an entirely separate concern. The active business will be in charge of Herbert Black, who is one of the best known men in pig iron and coke circles in this part of the country, having formerly been assistant to Frank Eaton, who resigned as resident partner and manager of the Cincinnati office of Hickman, Williams & Co., because of ill health. The company has organized with the following officers: President, Julius Fleischmann; vice president and general manager, Herbert Black; treasurer, Wm. E. Minor, and secretary, Charles J. Christie.

Price Advances Are Probable

New York, June 30. (By wire.)—Tonnage continues to come in so liberally that further advances in plates, shapes and bars is now being considered by leading makers. The announcement of an advance to 1.30c, Pittsburgh, is expected before many days.

The report that the Corporation has purchased pig iron, coke and billets is premature. It is understood, however, that the largest producer is now figuring on taking a good tonnage of open hearth billets from another maker.

The El Paso Southwestern has ordered 8,000 tons of rails from the Colorado Fuel & Iron Co.

THE OPEN HEARTH

Keep on Using American Ball Bearings

DUE to the war, the ball bearing industry in this country is in the process of being revolutionized. Imports from Germany, Italy and Switzerland have been completely cut off and practically our only remaining foreign source of supply is Sweden. The present situation naturally is working great hardship on importers, whose stocks in most cases by this time are exhausted. The importers of ball bearings are co-operating earnestly with importers of other commodities, principally through protests and formal statements lodged at Washington, to bring about a more liberal attitude by England with regard to shipments from continental Europe. Judging from developments up to date, the outlook for a favorable result from these protests cannot be regarded as promising.

It has become necessary, therefore, for machine tool, automobile and a host of other manufacturers who use ball bearings to depend entirely on the domestic product. American ball bearing manufacturers, as a result, are flooded with orders and find that the volume of their sales is limited only by the capacity of their plants. The direct effect of the present situation is reflected by the extent to which ball bearing manufacturers on every side are establishing new plants and installing additional equipment. Altogether it is a time of golden realization and of further golden promise to the industry in this country. Not only do the domestic manufacturers have the domestic field almost entirely to themselves, but they realize that this field is a rapidly growing one, since the makers of all kinds of machinery, and apparatus embodying mechanical principles, more and more are improving their products by specifying the use of ball bearings.

It is interesting to speculate as to the state in which the industry will find itself after the conclusion of the war, when European manufacturers will commence the peaceful but unremitting struggle to regain their lost markets. In this struggle the question of quality will have a deciding influence, especially in view of the fact that a great many American consumers of ball bearings have preferred the foreign product when their requirements were exacting. In countless cases, American users have paid for foreign-made ball bearings higher prices than they needed to pay in this country, believing that the foreign article embodied quality and precision of workmanship in higher degree. It is well known that in late years domestic manufacturers have greatly improved the quality of their product; that they must devote a great deal more effort to overcoming preferences for foreign-made ball bearings, however, is too apparent to require explanation. In this connection, it has been intimated in certain quarters lately that, owing to the energies they are expending in speeding up production, domestic ball bearing manufacturers now have little time for bestowal upon the matter of improved quality. That this fear is groundless appears to be demonstrated in ample fashion by the record of American industry in general. It seems reasonable to expect that when normal international trade relations again are established, it will be found that American ball bearing manufacturers will have made use of their unprecedented opportunity to such good effect that American consumers, in the light of their experience, will be unanimous in believing that the American ball bearing is at least the equal of any made.

How Would He Do It?

SENATOR Theodore E. Burton, of Ohio, has been to South America. Shortly after casting aside his senatorial togs last March, he started on an extended trip to the sister republics of the south and visited nearly every South American country. He comes back enthusiastic over the possibilities of trade development between this country and the republics of South America.

"South America is growing more rapidly than any other section of the world," says the senator. "We have the opportunity now to capture all the trade formerly held by Great Britain and Germany. Germany is firmly intrenched in South America, but we can gain trade supremacy despite her lead. The German firms have sent to the South American republics their young men, who have settled there, learned the language, and intermarried with the Spanish. This has given them a tremendous advantage over us."

But, of course, the important question is—how are we going to get this trade? Certainly it is not to be had merely for the asking. Nor can we depend upon the European war to insure it to us forever. Now listen to the senator. He says: "To develop their trade, the United States needs more than anything else to establish a fast line of steamers running to Rio Janeiro and Buenos Ayres. The present steamships take 15 days now to go to Rio Janeiro when boats running there direct could make the trip in seven days. The 24 days' voyage to Buenos Ayres could be cut down correspondingly, bringing the countries much closer to the United States."

It seems strange indeed that this honorable senator, who, for a quarter of a century has been a steadfast opponent to the upbuilding of the American merchant marine, had to go to South America to find out the

THE OPEN HEARTH

importance of establishing a line of steamers between this country and South American ports.

What does the senator propose to do about it now? Even after the great war was declared, in a speech made at Cleveland he declared that the primary reason the United States does not have a merchant marine is that its citizens are not seagoing people and are not adapted to the work of building up a merchant marine. Has he changed his mind on this subject, or has he merely recalled that prior to the civil war United States had a merchant marine of which it was proud? Would he be willing now to have congress lend a helping hand in the upbuilding of the merchant marine? What does the senator propose to do about it? In view of his long record of consistent opposition to merchant marine bills, he will find it difficult to convince the people that any genuine support can be expected from him.

Closer Co-operation Needed

THE great war is bringing home to the manufacture of the United States the importance of acting more closely in harmony, not only in meeting problems of the present, but also in solving those which are bound to be confronted after peace is restored. Some weeks ago, in a letter to *The Iron Trade Review*, Charles S. Powell, of Cleveland, proposed the formation of a clearing house for manufacturers, in order to enable them to handle more satisfactorily business coming to this country in connection with the war. Mr. Powell's article, which pointed out very clearly the exasperating conditions under which many manufacturers have been trying to contract with foreign buyers, has brought a number of interesting letters to this office. Almost without exception the writers express the belief that a bureau, or clearing house, or association of some kind should be formed, but it is pointed out that recently some progress has been made toward improving conditions through the appointment of J. P. Morgan & Co. to be representatives of the allies in this country. It is evident, however, that the present plan is not entirely satisfactory and no one seems to have a definite idea as to what plan could be adopted which would be free from objection by the government. One letter received by *The Iron Trade Review* suggests that if manufacturers should organize to carry out Mr. Powell's plan, they might have an inclination to hold the price to the highest possible point and this would destroy the principle of competitive bidding. "There is no person or nation," says this writer, "who does not want to buy goods as cheaply as possible, and just because an urgent demand is made for certain articles, no undue advantage should be taken and the price boosted." This writer has misunderstood the plan, for it did not aim to bring about destruction of competition, but merely to promote the interests of manufacturers in a perfectly legitimate way.

Probably it will be necessary to obtain government sanction for any plan of co-operation and it is encouraging to note that Chairman Joseph E. Davies, of the federal trade commission, in a recent address at Chicago, recognized the necessity of permitting manufacturers to co-operate in meeting conditions present and prospective. He says that local price discrimination, whereby prices are lowered in one community for the sake of driving out competition and at the same time raised in another locality, is prohibitive as between residents of the United States, and he adds it is urged that the same degree of protection should be afforded American industries from unfair foreign competition. He is not definite at all and does not say what he would recommend. He does remark that the tariffs have been found to be unsatisfactory in affording protection against objectionable practices by foreigners, but he does not tell how he would protect the American manufacturers. He says that dumping by foreign monopolies is vicious and may be a greater menace at the conclusion of the war than it is now or ever has been. He does not indicate how he would prevent this dumping, but the mere fact that he sees the danger offers some encouragement. He refers to the cartels in Europe and perhaps this reference is intended as a hint as to what might be done in this country.

Perhaps Mr. Davies was helped in getting a clearer vision of things by the recent hearing before the federal trade commission in New York, in which such a low tariff man as W. L. Saunders, chairman of the Ingersoll-Rand Co., expressed the opinion that German manufacturers would have the support of their government after the war in dumping goods in this country and elsewhere to recover their lost trade. No one need have doubt as to the German government standing back of its manufacturers. It always does. The question is—what will the American government do? It cannot content itself by indulging in pleasant remarks such as those made by Mr. Davies at Chicago. It must co-operate with the manufacturers in forming a definite program of co-operation in promoting foreign trade during the war and after the establishment of peace.

The government should also adopt a definite, scientific plan to insure protection to American industries when the struggle for the world's business is renewed. If, as the President claims, the federal trade commission has power to deal with the tariff, it ought to lose no time in getting busy.

Prices Present and Past

Quotations on leading products June 30, Average for May, 1915, average for March, 1915, and average for June, 1914. Prices are those ruling in the largest percentage of sales at the dates named.

	Prices June 30. 1915.	Average for May, 1915.	Average for March, 1915.	Aver. for June, 1914.
Bessemer pig iron Pittsburgh..	$14.60	$14.55	$14.55	$14.90
Basic pig iron, Pittsburgh.....	13.60	13.45	13.45	13.90
No. 2 Fdy. pig iron, Pittsburgh	13.45	13.45	13.45	13.90
Northern No. 2 Fdy., Chgo....	13.00	13.00	14.25	14.25
Lake Superior Charcoal, Chgo..	15.75	15.25	15.50	15.75
Malleable, Bessemer, Chgo.....	13.00	13.00	14.25	14.25
Southern No. 2, Birmingham...	9.50	9.75	9.50	10.45
Southern Ohio No. 2, Ironton.	12.50	12.50	12.75	13.50
Basic, eastern Pa.....	13.75	13.25	13.50	14.00
No. 2X Virginia furnace.....	12.50	12.50	12.50	12.50
No. 2X foundry, Philadelphia..	14.25	14.25	14.25	14.75
Ferro mang., Balt., (prompt)..	105.00	100.00	78.00	38.00
Billets, Pbgh.	20.50	19.50	19.50	19.75
Sheet bars, Pbgh.....	21.50	20.00	20.00	20.75
Steel bars, Chicago.....	1.44	1.39	1.38	1.28
Steel bars, Pittsburgh.....	1.05	1.20	1.15	1.115
Iron bars, Philadelphia.....	1.17	1.17	1.12	1.17
Iron bars, Cleveland, local del'y	1.20	1.20	1.15	1.20
Iron bars, Chgo. mill.....	1.20	1.15	1.17	1.10

	Prices June 30. 1915.	Average for May, 1915.	Average for March, 1915.	Aver. for June, 1914.
Beams, Chicago	$1.44	$1.34	$1.43	$1.28
Beams, Pittsburgh	1.25	1.20	1.15	1.115
Beams, Philadelphia	1.359	1.359	1.25	1.25
Tank plates, Pittsburgh.....	1.20	1.125	1.125	1.10
Tank plates, Chicago.....	1.34	1.29	1.38	1.28
Tank plates, Philadelphia.....	1.359	1.359	1.259	1.25
Sheets, blk., No. 28, Pittsburgh	1.80	1.80	1.80	1.82
Sheets, blue an., No. 10, Pbgh.	1.35	1.35	1.30	1.35
Sheets, galv., No. 28, Pbgh....	5.00	3.40	3.40	2.77
Wire nails, Pittsburgh.....	1.55	1.55	1.60	1.50
Connellsville fur. coke contr...	1.65	1.65	1.65	1.85
Connellsville fdy. coke, contr...	2.25	2.25	2.25	2.35
Heavy melting steel, Pbgh....	11.75	11.75	12.00	12.00
Heavy melting steel, east'n Pa..	11.50	11.25	11.00	10.75
Heavy melting steel, Chgo.....	9.75	9.25	9.89	9.75
No. 1 wrought eastern Pa.....	12.50	12.50	12.50	12.50
No. 1 wrought, Chgo.....	8.75	8.75	9.00	8.88
Rerolling rails, Chgo.....	10.00	10.00	11.25	11.25
Car wheels, Chgo.....	10.00	9.75	11.75	11.25

(For Additional Prices See Page 62.)

Confident of Improvement in Pig

Sellers Believe Greater Activity is Near, But Buying at Present is Light—Some Sales of Bessemer at Pittsburgh

Pittsburgh, June 29.—Several consumers of steel making pig iron in the Greater Pittsburgh district have been figuring in the market the last few days. The Marshall Foundry Co. has closed for 5,000 tons of bessemer for last half delivery at current market prices; the Union Steel Casting Co. has taken 1,500 tons of the same grade for fourth quarter delivery at $13.75, valley, and a valley interest has sold 550 tons of bessemer for shipment to Italy. Sales of valley bessemer for export to Italy now involve about 20,000 tons, some of which is yet to be shipped. Demand for foundry grades continues rather heavy. A local consumer who closed for 1,000 tons of malleable a fortnight ago has taken an additional 500-ton lot for last half shipment. No. 2 foundry and malleable have been selling at $12.50, valley, and above. The Colonial Steel Co. has not yet closed its inquiry for 10,000 tons for basic for last half shipment. Some basic sellers are refusing to shade $12.75, valley, but the position of the market is not clearly defined. The pig iron market in this district has not kept pace with that for finished products in the march of improvement that has featured the general steel industry the last few months. Pig iron dealers express confidence, however, that higher prices soon will prevail.

Improvement Expected

Philadelphia, June 28.—Prospects for later betterment in the pig iron market are helping producers in a somewhat conservative attitude as to forward selling, but the situation for the next several months still is showing only slight improvement in this territory. The sentimental side of the market appears to be in favorable shape; the new tonnage now being offered, however, is not of such a size or character as to tone up the whole situation or to strengthen the loose points. Bookings in June among eastern Pennsylvania makers were less than in May, but shipments have been heavier. The outgo of tonnage to the consuming trade remains the most encouraging and perhaps the most significant aspect of the present condition. Steel making irons still give a good account of themselves. In basic a Lebanon, Pa., consumer who is starting a new open hearth works reports having closed on 6,000 tons for July-September delivery, recently inquired for. Where this business went is not yet clear, since, as far as learned, none of the regular eastern Pennsylvania sellers who uniformly quoted $14, delivered, took the order. On the recent Trenton, N. J., sale of basic previously covered, the seller, it is understood, realized slightly under $13.50, furnace. Standard low phosphorus makers have advanced again to $21.50, Philadelphia basis, and in the week refused orders for Canadian delivery at $21, Philadelphia. For the first time in some months, shipments of standard low phosphorus now exceed the furnace make. Foundry iron still is subject to some irregularity in price. The tendency among eastern Pennsylvania makers is to hold for the maximum of recent ranges, but there are exceptions, especially where outside competition interposes close figures. The Philadelphia range for northern No. 2X is unchanged at $14.25 to $14.50. A Philadelphia machinery builder bought 1,000 tons of Alabama No. 2 at $9.50, Birmingham, or $14.03, delivered, and is negotiating for 1,500 tons of northern. A Trenton sanitary ware manufacturer closed for 1,500 tons of No. 2X and No. 2 plain for last half, most of which went to central Pennsylvania at $12.50, furnace, or about $14.45, delivered. An eastern Pennsylvania furnace took some of the order. The Baldwin Locomotive Works is understood to have closed on its recent inquiry for 1,500 to 3,500 tons.

(For complete prices see page 62.)

Other foundry sales have run to small amounts. A Philadelphia buyer closed for a small lot of prompt malleable at $12.25, Buffalo basis, or $14.83, delivered. Virginia sales are limited.

Takes a Quiet Turn

New York, June 29.—After a rather active week in pig iron in this territory, as compared with recent similar periods, the market has turned quieter and buyers do not seem so desirous of placing supplementary orders. Sales of the week in this and nearby districts totaled probably 15,000 tons, a considerable part of which went to Buffalo makers, one of whom, especially, has been bidding actively for business at $12.50, Buffalo, or $14.34 at Jersey points. Among the sales made were 3,000 tons of malleable for last half to a Branford, Conn., consumer, which went to a Buffalo maker, water delivery to be furnished; 2,000 tons of No. 1X and No. 2 plain to a Paterson, N. J., buyer, divided between Buffalo and eastern Pennsylvania makers at $14.25, delivered, and slightly higher, for the higher silicon and at a shade below $14, delivered, for the lower silicon grades; 1,000 to 2,000 tons of No. 2 plain and No. 2X to a Newark shop, part of which also is credited to Buffalo; about 1,000 tons to a Jersey City stove manufacturer and other lots. The American Malleable Co. bought 1,000 tons of malleable for Owosso, Mich. An Elizabeth, N. J., buyer is out for 2,000 tons of high silicon for last half and an inquiry for 5,000 to 10,000 for a nonconsumer from which not much result is expected, has been placed before sellers. Prices still hold to the range of $14.25 to $14.50, tidewater, for No. 2X. One Buffalo maker now is holding out firmly for $13, furnace, and a further movement toward the hardening of that price is expected, but the $12.50 figure has not disappeared. Export sales remain moderate. An additional lot of 500 tons of western steel-making iron has been sold to Italy. Some other foreign tonnage is pending.

Plow Company Inquires

Cleveland, June 29.—An inquiry for from 9,000 to 10,000 tons of charcoal, bessemer, malleables and foundry grades for delivery during the first half of 1916 has been sent out by a large Indiana plow company. While some furnaces are figuring on the business, they are doing so in a conservative way and they are not anxious to sell at present for delivery after Jan. 1. Some furnaces are refusing to quote at all. Aside from this inquiry, very little business is pending in this district, but the melt continues to call for liberal shipments.

Inquiry Improves

Cincinnati, June 28.—Inquiry is a little better, but transactions could still be considered to be at a minimum. A northern Ohio manufacturer is inquiring for 1,000 tons of charcoal iron, and another from Michigan wants 500 tons of the same grade. An inquiry is also out from Michigan territory for 1,000 tons of coke malleable iron. A local melter and one from Louisville, Ky., are asking for 500 tons each, to be divided between northern and southern makes. Shipments on old contracts continue to be equal to the output of furnaces in this district. Southern No. 2 foundry iron is quoted at from $9.05 to $10, Birmingham basis and southern Ohio No. 2 foundry is quoted at from $12.50 to $12.75, Ironton basis, both for last half delivery.

Pig Iron More Active

Chicago, June 29.—Conditions in the northern pig iron market continue to improve. Shipments for June are in excess of those for May, which in turn exceeded April. Sales are increasing and the most encouraging feature of the market is a much enlarged business from malleable users. This sort of iron has been exceedingly slow for several months and recently began to revive. At present, inquiries aggregating about 10,000 tons are current, most in lots of 2,000 tons each. A car builder in Indiana recently closed for about 2,500 tons of malleable, which probably will be furnished by a Toledo furnace.

Prices on northern No. 2 foundry and malleable are firm at $13, Chicago furnace, with no concessions. This price applies to entire last half.

Southern iron is somewhat less active and southern sellers apparently are not pushing matters, as they seem to be well sold for the entire last half. One large interest represented here has no tonnage remaining for this year except some low silicon, graded as No. 2, which usually is the last to be sold. This interest is asking $9.75, Birmingham, for third quarter and $10, Birmingham, for fourth quarter. Some possibility exists of obtaining immediate tonnage at $9.50, Birmingham, but this is growing scarcer.

Charcoal iron is firmer with increasing sales at $15.75 to $16.25, Chicago, for Nos. 1 to 4.

Sale of 5,000 Tons of Basic

St. Louis, June 29.—The most important transaction that has taken place in the local iron market recently was the sale Friday of 5,000 tons of northern basic iron to a local steel foundry. The inquiry had been out only a few days before the sale was closed. The price was not made public.

Inquiry today is confined to a few carload lots, and there is nothing in sight to inspire confidence of an early improvement in conditions. Southern No. 2 is quoted at $10, Birmingham basis. Northern iron is held at $14, Chicago, and $13.50, Ironton.

Inquiry More Active

Birmingham, Ala., June 28.—Inquiry in the local iron market is more active, but sales show little if any improvement. The prevailing price for No. 2 foundry is $10. One offer of 5,000 tons at $9.75 was refused by two makers during the week.

Announcement is made by the Tennessee Coal, Iron & Railroad Co. that within the next week or two No. 5 furnace at Ensley will be placed in blast and the Woodward Iron Co. also expects to place in blast another furnace within a few days.

Shipment on old orders is good and makers state that yard stocks are becoming lower than in some time.

Buffalo Sales 12,000 Tons

Buffalo, June 29.—Furnaces of the Buffalo district report sales for the week totaling about 12,000. The activity of foundry grades seems to be improving. The week has also developed a larger total inquiry for malleable as well as the foundry grades of iron. There is a considerable tonnage remaining unplaced as yet.

Shipments of iron continue to be heavy and a greater number of the melters are anticipating on their requirements, extending well into the last half of the year.

The range of prices practically precludes a schedule showing grade differentials. One interest is asking $12.75 to $13.25, covering all grades, while another has softened its minimum slightly on the lower grades to $12.25 and is asking up to $13 for its iron, leaving a spread of $1 to cover the range and the differences in the quotations of the different furnace interests and making a price of $12.25 to $13.25 cover the market at Buffalo.

The Western Reserve Steel Co., Warren, O., has placed an order with the Shaw Electric Crane Co., Muskegon, Mich., for a 1-ton overhead crane for use in the pickling and annealing department.

The foundry of the Hersh Stove Co., Allentown, Pa., has been damaged by fire to the extent of several thousand dollars.

(For complete prices see page 62.)

Heavy Shipments of Bars

In Which Domestic Demand is an Important Factor—Pennsylvania Railroad Will Require Reinforcing Material

Philadelphia, June 28.—Heavy shipments and specifications for steel bars, with a consequent receding of delivery promises, are the most striking features of the situation. With some mills, specifications from buyers in this district the past week have been the heaviest this year and one large maker in diversified lines reports its June shipments, much of them in bars, will reach the highest in over two years. Bars for ammunition manufacture play a prominent though not a predominant part in these shipments; a large portion is for more purely domestic needs and the movement has been stimulated by the fact that many 1.15c, Pittsburgh, contracts expire Wednesday. Buyers are being urged to get in specifications as some makers are promising no shipments under 30 days. The Jones & Laughlin Steel Co. has taken 325 tons of bars for Panama at 1.429c, delivered. The Pennsylvania railroad will require a considerable tonnage of reinforcing bars for extensive grade crossing improvements upon which it now is figuring. The work on the Schuylkill division alone calls for 700 to 800 tons. All the leading makers with possibly one exception now are quoting 1.25c, Pittsburgh, or 1.409c, Philadelphia, for prompt or third quarter. The Jones & Laughlin Steel Co. adopted this price a few days ago.

War Orders Predominate

Pittsburgh, June 29.—Manufacturers of steel bars are taking numerous orders for war material. While details of such orders are not announced, yet it is known that tremendous tonnages are involved in the aggregate. Steel bars are firm at 1.25c for third quarter delivery. Many domestic consumers have attempted to increase orders for shipment before Oct. 1. Makers are scrutinizing orders carefully to prevent speculation. Iron bars have been advanced to 1.30c by several mills in this district and the 1.25c figure rapidly is disappearing.

More Rounds for Shrapnel

New York, June 29.—An additional order for 25,000 tons of 3¼-inch rounds for the manufacture of shrapnel has been placed with the Lackawanna Steel Co. by representatives in this country of the French government. This company previously had received orders for about 50,000 tons of similar material from the same source. Another lot of 20,000 tons of shell rounds is on the verge of being closed. Other important orders of this kind are under negotiation, but, as noted a week ago, the mills are holding for, and obtaining higher prices on this class of material. There is considerable demand for 4¼-inch rounds for high explosive shells. In the domestic trade, the expiring of second quarter contracts July 1, has been stimulating specifications and the tonnage has been active and in good volume. Steel bar prices now seem well-established at 1.25c, Pittsburgh, or 1.419c, New York, for prompt or second quarter.

Rounds For Shells

Cleveland, June 29.—Many inquiries for rounds to manufacture ammunition are appearing, the largest being one for 60,000 tons, and another for 40,000 tons. It is understood that the 60,000-ton inquiry is for long lengths to be shipped to France. Owing to the fact that numerous mills of the Steel Corporation and independents are well supplied with orders for bars, some having enough to keep their plants busy for several months, the inquiries for war material are not being received with much favor. It is probable that a pretty high price will be named.

Buy More Iron Bars

Chicago, June 29.—Somewhat better specifications are being received by bar iron mills, although the situation is not yet strong. Mills will close down Wednesday of this week until the wage discussion with the Amalgamated Association has been settled and most mills will take advantage of this occasion to make repairs about their works. Probably one to two weeks of idleness will result from these two causes.

No change has taken place in the quotation of bar iron, 1.20c, Chicago mill, remaining firm.

Steel Bars Strong

Chicago, June 29.—Conditions in the market for steel bars are unchanged except that they grow more favorable weekly. Both new business and specifications on existing contracts are in heavier volume and deliveries are becoming more and more deferred, three weeks being about the shortest to be obtained at present. Quotations on steel bars are strong at 1.44c, Chicago mill, for third quarter and probably $1 per ton higher for the final quarter of the year.

Agricultural implement makers are out of the market, having closed for their requirements during the past two weeks. Sellers claim this business was placed entirely on a six months' basis, but it is strongly suspected that some buyers were able to effect an understanding as to the first half of next year as well.

Rerolled bars for reinforcing are not in strong demand and mills turning out this material are working on slow schedule. Prices remain at 1.20c to 1.25c, Chicago.

Iron Improves Slowly

Philadelphia, June 29. — Some improvement in the position of the bar iron market in eastern Pennsylvania continues to be observed, but the development is coming slowly. Prices, on the whole, appear firmer, with 1.15c, at the mill, for common iron bars as the general quotation. This figure has been shaded, however, within a few days on attractive lots. Operations, on the whole, are somewhat better.

Hoops, Bands and Shafting

Pittsburgh, June 29.—The 66 per cent off price for cold rolled shafting announced a week ago by the Columbia Steel & Shafting Co., rapidly is becoming general and indications are that lower quotations will soon disappear entirely. Demand for shafting is heavy and most mills are running at capacity with enough orders on their books to assure activity for two or three months. Steel hoops are quoted at 1.30c, but the 1.25c figure has not entirely disappeared. Bands are being quoted at 1.25c, the price commanded by steel bars.

Wire Mills Break Records

Pittsburgh, June 29.—Despite comparatively light domestic demand for wire nails, wire mills in western Pennsylvania and eastern Ohio are operating at maximum rates, and tonnage records are being broken in some instances. Nails are nominally quoted at $1.60 a keg, but that figure is being shaded $1 a ton for immediate delivery in many cases. Demand for plain wire, barb wire and nails for export is heavy. Several mills are refusing to incur additional obligations for prompt delivery.

The Carnegie Steel Co., Pittsburgh, now is operating 45 of its 59 blast furnaces, having blown in an additional stack this week. The low point for the Carnegie company was last December, when only 23 of its blast furnaces were operating.

(For complete prices see page 62.)

Best Month in Two Years

Was Recorded by American Sheet & Tin Plate Co.—Automobile Demand for Sheets Heavy

Pittsburgh, June 29.—From a standpoint of new orders and specifications for sheets, the American Sheet & Tin Plate Co. in June enjoyed the best month it has experienced for more than two years. Several other sheet mills, not affected by decreased demand for galvanized material, have been enjoying considerable activity. Automobile interests, with few exceptions, have covered last half requirements and most contracts exceed those placed for shipment the first half of 1915. The continued abnormal price of spelter is affecting the output of galvanized sheets to a considerable extent. Some makers have withdrawn from the market entirely; others are asking from 5c to 6c for No. 28 gage. Black sheets are being held at 1.80c, base, but that figure is being shaded in adjacent territory.

Booking at Higher Prices

Philadelphia, June 28.—Further bookings of blue annealed at higher prices by eastern Pennsylvania sheet makers are reported. These transactions mainly are on third and fourth quarter contracts on which the minimum remains 1.35c, Pittsburgh, or 1.509c, Philadelphia, for No. 10 gage with $1 more asked for the more extended deliveries. For prompt business, 1.35c, Pittsburgh, is asked. Specifications are good and are sustaining full mill operations in this district.

Declines Slowly

Cincinnati, June 28. — The price on galvanized sheets is dropping very slowly, because of the gradual decline in spelter. No. 28 gage is given at 5c, Pittsburgh basis, in comparison with from 5c to 5.50c, Pittsburgh basis, last week. Black sheets are quoted unchanged at 1.80c, Pittsburgh basis. Sales are only fair, as mills will sell only for limited deliveries because of the uncertainty of the market, especially that on galvanized sheets. Rolling mills in this district are running full in all departments.

No Change in Sheets

Chicago, June 29.—Galvanized sheet makers continue to remain entirely out of the market and such supplies as are being obtained by users come from store. Black sheets remain weak at former quotations with demand light.

Tin Plates More Active

Pittsburgh, June 29.—Fairly good demand for tin plate for shipment abroad is enjoyed by tin plate manufacturers in western Pennsylvania and eastern Ohio. The domestic market shows marked improvement, but prices are unchanged. Most mills are being driven at maximum capacity.

Coke Market

Affected by Labor Conditions—Italians Going to War

Pittsburgh, June 29.—Many Connellsville coke oven operators have advanced wages the last fortnight to meet the standard scale established by the H. C. Frick Coke Co. and indications are uniform rates will prevail in the upper and lower Connellsville regions after July 1. At one of the more prominent plants, about 1,000 laborers were out on a strike three days last week, but returned to work when the standard wage scale was adopted. Increased overhead expenses, combined with the cessation of work during the July 4 celebration, have caused dealers to advance quotations sharply for prompt delivery. According to many expressions, $1.75, ovens, represents the bottom of the market for prompt delivery. Dealers report fairly good demand for spot coke and several tentative negotiations for contract fuel are pending. Foundry interests are specifying somewhat more briskly, but normal tonnages are not being taken. The *Connellsville Courier* for the week ending June 19, says production was 348,510 tons, an increase of 13,996 tons compared with the week before. A new high production record for the year was established the week ending June 19.

Sale to Lead Plant

St. Louis, June 28.—The sale of 36,000 tons of coke to a local lead plant last week was the largest that has taken place for a long time. Connellsville and Virginia foundry grades are held at $2.50 to $2.75, but business is exceedingly dull.

Labor Shortage Feared

Cleveland, June 29.—Sellers of foundry coke representing Connellsville companies are notifying customers that there is great danger of a labor shortage, owing to the departure of many Italians from the coke region to enter the war and that it would be well for foundries to order shipments of coke at the present time, so as to be ready for any emergency. Foundries have been contracting pretty freely for a number of weeks and nearly all are now covered for their requirements for a year, or, in some cases, for six months.

Furnace Coke Inquiry

Cincinnati, June 28.—The coke market continues good. One southern Ohio furnace is out for 20,000 tons for the last half, and another stack in this territory is inquiring for about the same amount. The Louisville & Nashville railroad, with offices at Louisville, Ky., is asking for 3,000 tons of 72-hour grades. The market on foundry coke has slackened, but this is because the majority of foundries have closed for next year's requirements, beginning July 1. Prices are unchanged on all grades from the Wise county, Pocahontas and New River districts.

Warehouse Prices

Are Advanced at Philadelphia—Steady Improvement Continues

Philadelphia, June 29. — Warehouse prices in the Philadelphia district have been advanced $2 a ton on plates, shapes and bars and $1 a ton on iron bars, effective June 23. The new schedule holds plates, shapes and steel bars at 1.80c, delivered, in the Philadelphia district and iron bars at 1.60c. The volume of business among the jobbers in this territory has been improving steadily and the market now is quite brisk.

Checked by Strike

New York, June 29.—The present strike of inside iron workers is having a deterrent effect on the warehouse business in this territory, particularly in structural steel. Although the large fabricating plants are not affected, the smaller shops usually buy freely from the jobbers and a good deal of this business now is obstructed. Talk continues in the market of a probable advance in warehouse prices in New York territory within a few days. The rise may be $2 a ton, which would place plates and shapes at 1.95c, New York, and steel bars at 1.90c, New York.

Continued Improvement

Cleveland, June 29.—The gradual increase in the volume of warehouse business which has been noted every month for several months has again been recorded and June shows a moderate increase over May, with the prospect that the July record will be very much better than June.

(For complete prices see page 62.)

Prices for Plates Vary

Some Makers Still Willing to Book Orders at 1.15c, Pittsburgh, But Higher Quotations Are More General

Philadelphia, June 28.—Four additional tankships have been placed by the Standard Oil Co. with the New York Ship Building Co. These vessels will require from 12,000 to 14,000 tons of plates, but as they are not to be delivered for 20 to 22 months because of the heavily booked position of this yard, the steel will not be required until later. It is expected eventually to be furnished by Pittsburgh mills. These awards increase to 43 the total of merchant boats placed with Atlantic ship builders during the present movement. A large amount of figuring on further new construction continues. There is considerable dissimilarity of conditions both as to bookings and as to prices among eastern Pennsylvania plate makers. Some makers report a very liberal flow of new business which exceeds capacity except in universal plates and one mill is maintaining 90 per cent operations. Other plants are running 10 to 20 per cent less. In prices, some eastern Pennsylvania makers are holding and obtaining 1.25c, Pittsburgh, or 1.409c, Philadelphia, on third quarter or last half contracts. Others still will book forward tonnage at 1.20c, Pittsburgh, and early lots have been done within a week at 1.15c, Pittsburgh. The larger middle western mills now are quoting 1.25c, Pittsburgh, in this territory, the Jones & Laughlin Steel Co. being one of those to advance to that figure within the week.

Demand Improves

Pittsburgh, June 29.—The Carnegie Steel Co. and the Jones & Laughlin Steel Co. are quoting 1.25c. on plates, shapes and bars for third quarter delivery. Plates reflect improvement, but some irregularity still is noticeable. Specifications from car builders are coming out in good volume and general demand for plates is heavier than it has been for several months. One of the more significant features of the market for finished products is the fact that many consumers who covered third quarter requirements some time ago have since attempted to increase orders.

Plates are Stronger

Chicago, June 29.—Increased demand for railroad cars and other purposes in which steel plates are employed has resulted in this product gaining considerable firmness. While not yet on the same basis as bars and shapes, the situation is much stronger and promises to bring plates to a parity with bars in a short time. While 1.44c, Chicago, is being asked by some producers whose tonnage is strong, 1.34c, Chicago mill, is still being quoted by an independent maker in this territory for attractive specifications for immediate delivery.

Spelter Demand

Is More Active—Uncertainty as to Lead Owing to Concessions

New York, June 29.—Most of the metals during the week closing today have displayed a rather uncertain tone and the market generally has been in a waiting state. Spelter now is enjoying the most momentum. Toward the latter part of last week, a better demand and higher prices began to make their appearance, and this movement has become more pronounced. Most of the demand is from brass mills, but there is considerable from galvanizers, who, however, are in the market mostly for prompt and nearby. Prime western is quotable at 21c to 22c for prompt, July and August. The rest of the year is quotable at about 19c to 20c. Brass special spelter is quotable at 25c for nearby and 24c to 25c over the last quarter.

A great deal of uncertainty has been manifested in the lead market, due chiefly to the concessions offered by second sellers. These interests have been offering at 5.50c, New York, and less; at the same time all the independent producers have been holding to the price asked by the leading producer, which is 5.75c, New York. Demand is very quiet.

There is a somewhat better demand for copper, but on the whole the market is quiet, and a little lower. Electrolytic has been sold by some of the leading selling agencies at 20.12½c to 20.25c, delivered 30 days; second sellers offer limited quantities at around 19.87½c cash. Ordinary lake copper is held at 20.50c, cash, by producers, and arsenical lake at 20.37½c, cash; second sellers are not making many offers on lake. The best grades of lake copper are held at 23c to 23.50c, cash. Best brands of casting copper are held at 19.75c to 20c, delivered 30 days. Ordinary casting copper is held at 18.50c to 18.75c, cash.

There have been rumors of weakness in aluminum, based mainly on reports of a slackening up of business among the consumers of aluminum. While demand is in less volume, prices are about the same. Outsiders ask around 32c for carloads and 35c for less than carloads. The domestic producer has been taking some spot business lately at around 26c.

The antimony market continues quiet. Spot Chinese and Japanese is held at 37c to 37.50c. Futures have been selling at 34.75c, in bond, for May shipment from the far east.

Tin was dull early last week but since has reflected more activity. Sellers look for a good volume of buying for July. The market continues to hold up well and quotations are 40.25c to 40.75c in spot, 39.25c to 40c on July, 38.50c to 39c on August and 37.50c to 38c for September. There has been more activity right along in spot than in futures, due to the difficulty of getting guaranteed deliveries of futures.

Bolts Active

With Prices Well Maintained—Railroad Business Pending

Cleveland, June 29.—Bolt and nut manufacturers report that while railroad business which developed last week has not yet been closed, they did not expect it to be closed immediately, as the railroads usually take several weeks before contracting. The outlook for business is excellent. The question as to whether the new prices on rivets will be maintained has not yet been determined.

Nuts, Bolts and Rivets

Pittsburgh, June 29.—Manufacturers of nuts, bolts and rivets describe conditions as active. Specifications are coming out in good volume and considerable new buying is enjoyed. Prevailing discounts, manufacturers say, represent the bottom of the market; advanced quotations are being obtained in some instances. Rivets are firm on the basis of 1.50c for structural.

Strip Steel Advanced

Pittsburgh, June 29.—Manufacturers of cold strip steel have advanced quotations $2 a ton and are now quoting $2.85, base, as against the previous quotation of $2.75, base. Fairly heavy domestic demand is reported and several large orders for shipment abroad have been booked. It is not improbable another advance will be announced at an early date.

(*For complete prices see page 62.*)

Open Hearth Steel

Is Being Conserved and Leading Makers Will Not Quote

Philadelphia, June 28. — Practically none of the leading Pittsburgh, western Pennsylvania or Ohio valley steel makers now are willing to make quotations on open hearth billets in this and other eastern territory. The policy of conserving open hearth supplies because of the heavy demand for finished product, as has been noted for several weeks past, now seems to have found these makers out of the market completely. Some of them will offer bessemer billets, but are not making any promises as to how long this will continue. Eastern Pennsylvania makers of open hearth billets for the market continue to make sales carefully in view of the pinch on this grade of steel in Pittsburgh territory, and they are having no difficulty in obtaining higher prices. Quotations are being made, under condition of early acceptance. The volume of orders for billets is not heavy, but shows some betterment. Further sales for export are being made at satisfactory mill prices. The minimum on rolling billets by eastern makers is $20, Pittsburgh, or $22.56, Philadelphia. Forging steel is higher in accordance with individual specifications.

Semi-Finished Stronger

Pittsburgh, June 29. — Rather sharp advances have featured the market for semi-finished material the last ten days or two weeks. Youngstown makers are refusing to shade $20 for billets and sheet bars are being held at $20.50 and above at that center. With principal makers at Pittsburgh out of the market, it is difficult to get an accurate line on the situation, but some in close touch with the market say billets are not obtainable at less than $20.50 and sheet bars are commanding from $21.50 to $22, mill. Some sheet bar tonnage, it is understood, has sold at $22.50, mill. Forging billets are commanding as high as $27, Pittsburgh. One of the more important manufacturers recently has purchased a fairly large tonnage of billets in the open market. Some observers predict an acute scarcity of steel will be felt by October 1. Wire rods are listed at a spread from $25 to $26. Muck bar is commanding $28 a ton, or $1 above the previous nominal quotation.

Stewart M. Marshall, for many years chief engineer of the Cambria Steel Co., Johnstown, Pa., and who is very well known in the iron and steel industry, is now associated with the Southwark Foundry & Machine Co., Philadelphia, as manager of its turbine and centrifugal pump departments. Mr. Marshall will also have charge of all engineering matters relating to apparatus used in conjunction with turbines, such as blowers, electric generators, condensers, etc..

Coke Plant

Will Be Built at Toledo—May Add Benzol Plant Later

The Toledo Furnace Co., which operate two stacks at Toledo, O., has decided to build a by-product coke plant of 94 ovens, having a daily capacity of 1,000 tons of coke. The H. Koppers Co. has been awarded the contract for the ovens and it is expected that the laying of the foundation will be commenced before July 15 and finished by Oct. 1, and that the plant will be in operation by June 1 of next year. The plans have been arranged so that a benzol plant can be added at any time, but the company has not yet decided as to whether it will build such a plant.

The company will issue $1,500,000 in 6 per cent bonds.

Pipe Mills Active

Pittsburgh, June 29.—In addition to orders for a total of 112 miles of 6, 8, 10 and 18-inch pipe, involving 6,500 tons, mentioned a week ago, orders for about 60 miles of line pipe, from 2 to 8 inches, have been distributted this week. This order, involving 2,000 tons, calls for western Pennsylvania shipment. Pipe mills are operating at about 75 per cent of capacity. Discounts are described as firm. Demand for locomotive boiler tubes is fairly active, but merchant tubes show no snap.

Abandon Nail Mill

The receivers of the Central Iron & Steel Co., Harrisburg, Pa., have decided to tear down the puddling works and nail plate department and now are offering in the market equipment of this portion of the work. Among the machinery which will be sold are 103 nail machines, 18 puddling furnaces, a nail plate rolling train, a puddlin rolling train, nail plate shears, engines, annealing ovens, stacks, boilers, etc. It is also reported that the receivers of the Central Iron & Steel Co. have in view a considerable expenditure for modernizing the general plant of the company.

Edwin M. Herr, president of the Westinghouse Air Brake Co., has received the honorary degree of Master of Arts from Yale University.

(For complete prices see page 62.)

Cast Iron Pipe

Shows Tendency to Advance—Leading Company Low at St. Louis

New York, June 29.—Cast iron pipe trade in the eastern district is just about holding its own, and on the side of incoming tonnage the situation has shown little deviation during the past month. The tendency to hold for higher prices is quite general among makers, and there is some talk of further advances, if not at present, by the end of the summer. Some makers declare they will not accept less than $23, New York, for 6-inch, but some tonnage is being placed considerably lower. The United States Cast Iron Pipe & Foundry Co. has taken 3,000 tons of 6's to 20's for East Orange, N. J., and is the low bidder at $24.35, delivered, on 1,233 tons of 16 and 24-inch for Wellesley, Mass., and on 110 tons of 4 and 10-inch for Chestertown, Md., at $26.50 for the 4-inch, and at $23.45 for the 6-inch, 8-inch and 10-inch. R. D. Wood & Co. are low on 216 tons of 6-inch and 8-inch for Gardner, Me. Leroy, N. Y., has taken bids on 1,210 tons of 6-inch, 14-inch and 16-inch; Yonkers, N. Y., asked 500 tons of 6-inch and 8-inch for July 6, and Washington, D. C., for 1,450 tons of 3-inch to 12-inch for July 19.

United States Company Low

St. Louis, June 29.—On the 2,595 tons of cast iron pipe of various sizes, the United States Cast Iron Pipe & Foundry Co. was the low bidder, with an aggregate figure of $59,525.75, while the American Cast Iron Pipe Co. bid $60,693.50. On the 3-inch pipe, the United States company bid $32.85 per ton, and the American company $33.30; on the 6-inch and larger sizes, the United States company bid $22.85 and the American company $23.30 per ton. On the 350 tons of special castings, the Bessemer Foundry & Mfg. Co. was low, on a bid of $15,260. On the fire hydrants, etc., the Kennedy Valve Mfg. Co. was low with a bid of $19,754.50.

Some Cast Pipe Inquiries

Chicago, June 29.—Some fair tonnages of cast iron pipe are now being considered, Covington, Ky., asking bids on 3,600 tons to be submitted before July 8. Pratt, Kans., will open bids July 7 on 250 tons; Batesville, Ind., July 2 on 125 tons, and Stratford, Ia., July 1 on 200 tons, this being a contractor's job. The only item of importance recently is 2,500 tons at St. Louis, which was taken by the United States Cast Iron Pipe & Foundry Co.

Additions to Shipyards

And Extensions to Plants Making War Supplies Being Considered—General Structural Outlook Improved

Philadelphia, June 28.—Some good-sized projects are brewing quietly in this territory and these have to do with important extension of ship yard and war supply plants. The unprecedented demand for merchant ships along the Atlantic coast is rendering inadequate the present building facilities, and one plant here especially is expected to make a large expenditure to meet this situation. Another 4,000-ton enlargement of a works manufacturing war munitions is being quietly figured. The structural market in this district again is looking better in volume. The offering of the small class of work which had dropped off recently seems to have re-established itself and again is liberal. Eastern Pennsylvania shape mills are maintaining operations. In plain material prices, some spread remains. While the tendency is towards 1.25c, Pittsburgh, or 1.409c, Philadelphia, for third quarter, a schedule which some eastern mills have adopted, 1.20c, Pittsburgh, still is being made and it is quite probable an attractive tonnage for immediate rolling could shade this figure. From 6,000 to 7,000 tons of shapes will be required for new vessels just placed with the New York Ship Building Co.

Contracting More Freely

New York, June 29.—Advances in the price of plain steel apparently are operating to cause the placing under contract of some of the active structural projects which have been hanging fire. This is bringing about some betterment in the awards, particularly in western districts, according to reports to eastern structural companies, although it has not produced any important change as yet in the metropolitan district. An instance of this greater willingness to close contracts is shown by the award of the large Polk street freight warehouse, Chicago, by the Pennsylvania lines west, requiring about 14,000 tons, which was placed through the Thompson-Starrett Co., the general contractor, after short negotiations. The volume of new work offered in this district is a little better, especially in the smaller enterprises. A new elevated section in Brooklyn requiring 10,000 to 12,000 tons is offered for bids. Plain material prices still are lacking in uniformity and 1.20c, Pittsburgh, or 1.369c, New York, can be done without trouble, although larger makers are asking 1.25c, Pittsburgh. It is reported that certain mills may do even better than 1.20c, Pittsburgh, although such underselling seems to be disappearing.

Shapes Firm at 1.25c

Pittsburgh, June 29. — Structural shapes are being held firmly at 1.25c by the Carnegie Steel Co. and the Jones & Laughlin Steel Co. and no trace of quotations below that figure can be found in the open market. Fabricators are beginning to specify more briskly, although most of them need additional tonnages. The McClintic-Marshall Co. has taken a contract for the Pennsylvania freight warehouse at Chicago, involving about 14,000 tons, which will be furnished by a local independent steel concern.

More Inquiry

Cleveland, June 29.—The structural market shows distinct indications of improvement. This is not due to any large business pending, but to an increase in inquiries and increased firmness of prices.

Shapes are More Active

Chicago, June 29.—Tonnages of structural materials are moving with much more activity than has been the case for many months. Recent contracts placed in the west include 14,000 tons for the Pennsylvania railroad's freight station at Polk street, Chicago, which will be fabricated by the McClintic-Marshall Co., 5,400 tons for the Hannibal bridge of the Burlington railroad at Kansas City, to the American Bridge Co. and 1,100 tons for a viaduct in Kansas City, also taken by the American Bridge Co. The large tonnage, involving 24,000 tons, for the east approach to the free bridge at St. Louis will be considered June 29 and considerable competition has been aroused by this attractive piece of work.

American Bridge Co. Low

St. Louis, June 29.—On the 24,000 tons of steel for the east approach of the municipal bridge, the American Bridge Co. was low bidder, at 2.165c per pound. Other bids were as follows: Cambria Steel Co., 2.175c; Fort Pitt Bridge Co., 2.35c; McClintic-Marshall Co., 2.445c; King Bridge Co., 2.45c; Pennsylvania Steel Co., 2.55c; Phoenix Bridge Co., 2.59c.

CONTRACTS AWARDED.

Chicago, Burlington & Quincy R. R. Co., Hannibal bridge, Kansas, Mo., 5,394 tons to American Bridge Co.

Pennsylvania freight station, Polk street, Chicago, 14,000 tons, to McClintic-Marshall Co.

Humboldt County, Cal., Eel river bridge, near Scotia, Cal., 304 tons, to American Bridge Co.

City of Kansas City, Kans., Eighteenth street viaduct, Kansas City, 1,100 tons, to American Bridge Co.

Security Mutual Life Co. building, Lincoln, Neb., 476 tons to Jos. T. Ryerson & Son.

Atchison, Topeka, & Santa Fe Ry. Co. elevator at Argentine, Kans., 375 tons, to American Bridge Co.

Montreal Mining Co., shaft sets and stuttles, Hurley, Wis., 315 tons, to American Bridge Co.

Extensions to the plant of the Carpenter Steel Co., Reading, Pa., 150 tons, to the Eastern Steel Co.

Sugar mill at Antila, Cuba, for the Cupey Sugar Co., 700 tons, to the Eastern Steel Co.

Municipal building, Detroit, 1,000 tons, general contract awarded Irwin & Leighton, Philadelphia.

Plate and boiler shop for the Fore River Ship Building Corporation, Quincy, Mass., 2,500 tons, to the Boston Bridge Co.

Loft building at 626 Fifth avenue, New York City, 350 tons, the Hay Foundry & Iron Works.

High school, South Bethlehem, Pa., 200 tons, to Steel & Wike, Philadelphia.

Addition to the plant of Dodge Bros., Detroit, 1,000 tons, to the Russel Wheel & Foundry Co.

Commercial National Bank, Grand Rapids, Mich., 800 to 1,000 tons to American Bridge Co.

Grand Rapids Savings Bank, Grand Rapids, Mich., 800 to 1,000 tons, to Toledo Bridge Co.

CONTRACTS PENDING.

Pier 16, Hoboken, N. J., 2,000 tons, bids being taken.

Pier No. 7 at Balboa, Panama canal, 2,000 tons, bids being taken.

Three highway bridges for City of Philadelphia, 450 tons, bids being taken.

Industrial home, Muncy, Pa., 350 tons, bids being taken.

City Club, South Broad street, Philadelphia, bids being taken.

Section No. 1 of route 49 of Culver avenue elevated line, Brooklyn, 10,000 to 12,000 tons, bids on the general contract asked for July 20.

(For complete prices see page 62.)

Changes Name

The Scullin-Gallagher Iron & Steel Co. of St. Louis, by a vote of its stockholders, has changed its name to that of the Scullin Steel Co. The change was made, according to President Harry Scullin, as a matter of convenience. The officers of the company are: Harry Scullin, president; Frank L. Norton and George L. Davis, vice presidents; V. C. Turner, secretary-treasurer.

W. W. Butler, vice president of the Steel Foundries of Canada and the Canadian Car & Foundry Co., and a contracting engineer of Montreal, returned on June 27 from England, where he had been looking after details of some very large orders for ammunition shells placed with his company by the Russian government.

Steel Works Buy Scrap

Market in Eastern Pennsylvania Has Better Appearance and Improvement Noted in Chicago and Other Centers

Philadelphia, June 28.—Steel works in eastern Pennsylvania have been showing an inclination to buy more freely heavy steel scrap and other grades, and some further tonnage transactions have been closed. Buyers at Ivy Rock, Pottsville and Lebanon have been covering chiefly for No. 1 heavy steel and the price has been $11.50, delivered. It is reported, though not established, that one consumer paid more. At any rate, several of the brokers have been offering $11.50, delivered, at certain of these points. One important mill which has been offering $11.25, delivered, for steel appears in no urgent need for material, as it is credited with a stock of 15,000 to 20,000 tons. Other grades have been moving better and the market in general shows more life. Low phosphorus is in scant supply and higher, an off lot having brought $15.25, delivered. Cast iron pipe makers have been joining in the recent buying of heavy cast which continues in fair volume. Rolling mills have been buying wrought pipe and borings in larger amounts. An inquiry for 1,000 tons of car wheels has appeared for the British Isles, but not much of this grade is offered here. The Pennsylvania Railroad, however, has just put out for bids 1,000 tons on its June shop list.

More Selling

New York, June 29.—A better volume of scrap selling is being done by New York dealers and brokers, mainly heavy melting steel for the account of eastern Pennsylvania steel makers. Several thousand tons have been closed with two or three mills, usually at $11.50, delivered, and further negotiations at this level are going on. It is reported that a Lebanon, Pa., steel works paid more than $11.50, delivered, but this buyer required a special grade of material. Other grades are moving somewhat better. Prices do not advance, but tonnage, generally, is being done at the maximum of the present range. Car wheels are slow.

More Active Demand

Buffalo, June 29.—Dealers of the Buffalo district report a more active market with an even brighter outlook than was apparent a week ago. The principal consumer is taking considerable heavy melting steel. Within the past week sales of 3,000 to 4,000 tons of this line have been made in the Buffalo market. The dealers are confident that prices will stiffen in the near future.

Scrap Prices Advance

Pittsburgh, June 29.—While more important consumers are not figuring in the market, most dealers are advancing quotations for iron and steel scrap. Heavy melting steel is being held at $12.25 by some interests, but quotations have not been severely tested. Several mills have directed dealers to hold up shipments until further notice. Low phosphorus scrap continues to advance, some consumers say that material cannot be obtained at less than $16, delivered. The Pennsylvania railroad is asking bids on about 30,000 tons of rails, including about 26,000 tons of steel rails and 4,000 tons of iron rails, all of which are 6 feet and over in length.

Market Not Moving

Cincinnati, June 28.—The iron and steel scrap market is very quiet. No transactions are reported, and as a result, no changes in prices could be verified if any were contemplated. Rolling mills are specifying good shipments each week of heavy melting steel, bundled sheet scrap, and No. 1 bushelling. Jobbing foundries are taking only light and scattered lots of No. 1 machine cast, which dealers had hoped would be the best sellers in the market.

Firm at St. Louis.

St. Louis, June 29.—The scrap market remains firm and recent advances have been well maintained. Rolling mill grades are not in great demand, as operations are light and dealers are selling only such scrap as cannot be easily held. Inquiries for relaying rails are increasing, and prices are firm. Railroad offerings this week are: Chicago & Alton, 600 tons; Toledo, St. Louis and Western, 100 tons.

Scrap Advances Slightly

Chicago, June 29.—In sympathy with increasing prices of steel products, iron and steel scrap is strengthening and advances have been made in a few items, although only to a slight degree. Actual trading is not being done except in a small way and supplies still are uncomfortably large.

Railroads apparently find no end to their accumulations and are still pouring them into the waiting market. The Baltimore & Ohio railroad has a list before the trade containing over 12,000 tons, the Chicago & North-Western 1,800 tons and the Chicago & Alton 600 tons. In the Baltimore & Ohio list, 2,000 tons are steel rails, 1,000 tons each of car wheels and uncut heavy melting steel and 700 tons of No. 1 wrought. Fortunately, not all this heavy tonnage will be disposed of in this market, as a part is being held on the eastern division of the road.

(For complete prices see page 62.)

Rail Inquiry

Includes Large Tonnages for Russia and France

New York, June 29.—Russia continues to loom up as a very large buyer of railroad supplies and equipment in this country. That country still is actively negotiating for a very heavy tonnage of steel rails for early delivery for rebuilding some of its present narrow gage lines. The amount now in the market runs to very large figures and may exceed 150,000 tons of 90-pound sections. Action on this negotiation is expected in the near future. Russia also is figuring on placing additional rolling stock with builders in this country. One of these matters involves 2,000 box cars, originally placed recently with the Canadian Car & Foundry Co., but rejected by that company because of dissatisfaction with the terms of payment. This order is expected to go to either the American Car & Foundry Co. or the Pressed Steel Car Co. The car order recently placed by Russia, it is learned, calls for 5,000 hopper and 8,000 box cars, including the 2,000 box that are about to be reawarded. The Pressed Steel Car Co.'s portion of this order, it will be recalled, is 7,000 cars and includes all of the hoppers. It also is reported that some further locomotives may be placed. The Lima Locomotive Corporation has taken 50 additional, making its portion of the Russian order 100, and the total contract 500.

France is another country which is carrying on important negotiations. It remains actually in the market for about 100,000 tons of 90-pound rails, and there is talk that it will require 345 passenger coaches, but builders have as yet received no definite specifications regarding the latter and this matter is in indefinite form. An inquiry for 10,000 tons of rails for shipment to the west coast of Australia, on which bids are to be received July 7, is before the mills. The Intercolonial of Canada is understood to have placed 600 box cars with the Canadian Car & Foundry Co.

Among the roads in this country

there have been few developments of note during the past week in the equipment market. The New York Central lines are mentioned as preparing to enter the market for a large amount of equipment. While nothing definite yet has been put out, it is thought there is good basis for some action by this system in the near future. The Pressed Steel Car Co. has taken 40 ore cars for the Chilean Exploration Co. The car inquiries for the Chicago, Hamilton & Dayton and the Omaha road still are pending. Cars now in the market for domestic lines total 5,000 to 10,000. The Chicago Great Western has placed five locomotives with the Baldwin Locomotive Works.

Inquiry For Rolling Stock

Chicago, June 29.—Railroads continue to come into the market for additional rolling stock and the Chicago, Burlington & Quincy is inquiring for 2,000 box cars, bids for which will be in by the end of this week. The Chicago Great Western is inquiring for 1,500 steel underframes for cars it will erect in its own shops.

Recent contracts for cars have brought about greater activity among malleable iron founders supplying the specialties which go into the construction of freight cars. In addition to its freight cars, the Burlington also asks bids on 55 coaches and 10 dining cars.

Ensley Outlook Encouraging

Birmingham, June 28.—Official confirmation has been made by President Crawford, of the Tennessee Coal, Iron & Railroad Co., of the 21,000 tons rail order from the Frisco, reported in *The Iron Trade Review* two weeks ago. The rails are to be rolled for early delivery, it is said, and prospects for continued operations at the Ensley rail mills on about a 60 per cent basis are considered very favarable.

Safety Campaign

Victor T. Noonan, director of safety of the industrial commission of Ohio, started last week, in Cleveland, on his safety campaign to educate employes to exercise greater care in the prevention of accidents. Mr. Noonan, during the first four days of the week, directed his attention largely to foundries, in which, by formal addresses and by conversations with employes, he has shown how accidents can be prevented. After completing his work in Cleveland, Mr. Noonan expects to visit Youngstown, Dayton and other manufacturing centers.

Ferro Shipments

Expected to Continue During July at the Recent Rate

New York, June 29.—Shipments of ferro-manganese from England, which have been coming forward at the rate of about 8,000 to 10,000 tons monthly, promise to be maintained on this scale during July. The steamer Tunisiana, which was to bring in a shipment of 4,000 to 5,000 tons, was torpedoed by a German submarine the past week, while en route through the North Sea, to take on her cargo. A new vessel, the Malvern Range, and the Rapidan, now have been secured to bring in the ferro-manganese shipment in place of the damaged vessel. Some shipments of ferro-manganese also are coming forward on the Nicosian, the Dominion, the Magician, the Median and the Pomeranian. Arrivals of the week, amounting to several thousand tons, included lots aboard the Quernmore and Sylvania. Some licenses for August shipment now as being arranged.

The market on ferro-manganese shows little change. Small lots, such as five tons, are bringing from $125 to $130 a ton at the seller's plant. Some sales of the kind have been made. The range on small quantities of lump or ground material is from 5¾ cents to 6½ cents per pound at the grinding plant. In carloads, the spread on the prompt market is about from $105 to $115, delivered. The forward market continues at $100, seaboard. A sale of 50 tons for August delivery, to an eastern Pennsylvania consumer, on this basis, is noted.

The American Manganese Mfg. Co., operating the Dunbar furnace, is starting this week to manufacture 80 per cent ferro-manganese from Brazilian ore. Further shipments of Brazilian ore, consigned to domestic makers, arrived at eastern ports within the week.

Ferro-vanadium is in active demand with prices at $2 per pound at Pittsburgh of contained alloy.

Domestic Tonnage Increased

Pittsburgh, June 29.—Conflicting reports are heard with reference to the position of the market for ferro-manganese. Material is being offered at a range from $100 to $115, seaboard, according to delivery desired. A sale involving from 100 to 150 tons was made a few days ago on the basis of $100 a ton at the seaboard, but some dealers regard $105 as a more representative market quotation. The American Manganese Mfg. Co., Dunbar, Pa., now is operating one of its blast furnaces on 80 per cent ferro-manganese, which is being offered the trade for shipment after July 1. Fairly good demand for spiegel is reported, small lots are commanding $26 at the furnace, but attractive tonnages are obtainable at $1 and more a ton under that figure. Active demand for 50 per cent and lower grades of ferro-silicon is reported; prices show no change.

(*For complete prices see page* 62.)

Scarcity of Shells

Is Testified to by Workingmen Who Visit the Fighting Line

Office of *The Iron Trade Review*,
Prince's Chambers, Corporation St.,
Birmingham, England, June 18.

In spite of the sweeping German movement on the eastern front, our people take a cheerful view of the military position. It is well known that, apart from the geographical position, Russia achieves her purpose in the constant weakening of Germany. This country is concentrating on ammunition as it has never done before, and arrangements are being made to utilize every available machine and skilled workman for the production of shells. Recruiting goes on steadily, and when the equipment is equal to the strength of the new armies, we shall see decisive movements on the western front. In spite of its tremendous burden of £3,000,000 a day, the country is taking its financial load cheerfully, and we are not yet within sight of exhaustion. There are signs of a much better spirit among the work people, thanks largely to the frankness with which Lloyd George has taken the people into his confidence. His appeals have been supported by a deputation of eight work people from the Clyde, who have visited the fighting line and talked with the troops. These eight men all tell the same story of a scarcity of shell and high explosives, and their verdict is that the German superiority, so far, has been in the enormous volume of shell fire. It is acknowledged that our men are ready when we have thousands of tons of explosives to blow up the wire entanglements. Now that emphasis is being laid on the munitions question, we realize more fully the great value of the co-operation of America, even while that country remains on the side of peace.

Pig iron is firmer and best cold blast pig iron is quoted at $37.20 and bessemer at $24.24. In all kinds of finished materials, prices are advancing. Workmen are continually enlisting. Spelter is quoted at from $552 to $670 per ton.

How to Demonstrate Machine Tools

An Interesting Discussion of the Methods of the Man Who Puts Tools Through Their Paces—Great Tact and Ability Required

BY ALBERT A. DOWD

THE SUCCESS or failure of any machine to properly perform the operation for which it is intended, is dependent on a number of factors, all of which work together to produce the results on which a manufacturer depends for his reputation. Any one of these factors may be instrumental in selling more machines or may be the cause of unsatisfactory work and a consequent loss of business. Among these factors we have, primarily, the machine itself and its design, which is naturally an important item; also consideration should be given the design of tools and attachments by which the work is to be produced; the factory conditions under which the machine is to operate, and finally, the demonstrator who goes to the customer's plant and proves the value of the machine with its equipment.

The machine itself is naturally of great importance and should be selected with a view to conforming to a customer's needs both for the work on which it is to be used, and also bearing in mind the fact that changes are continually taking place which may require the discontinuance of the class of work for which it may have been intended and its future application on another variety. The customer who buys a single purpose machine not adaptable to varying conditions may find himself in difficulties, due to a change in manufacturing conditions at a future time. The design of tools and attachments by which certain work is to be accomplished comes next in importance, and should always receive the most careful attention, for unless the tooling arrangements are such as to produce the maximum output, the ultimate failure of the machine is likely to result. In the tooling arrangements, an intimate knowledge of existing shop conditions and a thorough understanding of the requirements of production are very important, so that the design may be made as economical as is consistent with conditions. The workmen who are to be engaged in the production must also be considered in their attitude toward a new type of machine, and tools and fixtures which are to be used must be as nearly foolproof as possible. In this connection, a great deal depends upon the type of machine to be installed and the class of men employed.

The demonstrator is of great importance both to the manufacturer and to the customer who purchases machine tools, for the manufacturer depends largely upon him to make sure that the new machine is properly installed and its manipulation thoroughly understood, while the customer also looks to the demonstrator to show the workmen how to get out his production in the required time. As the demonstrator's function is of so much importance, let us take up his work step by step, and see just how conditions are met and analyzed, and how his various capabilities are utilized to best advantage.

In the first place, let us consider his personality, which is a very important item. He must, first of all, be versatile and as much at home in talking to the superintendent as to one of the workmen, although it is not necessary for him to be a highly educated man. As a matter of fact some of the best demonstrators that I have known, are men of very little technical training, yet in their own line of work they "fill the bill" to perfection. The very best demonstrator that I have ever known is unable to write a letter without making a great many mistakes and when he sends in a report on a job it is a good deal of a task to decipher it. Yet he goes right to the point and makes his meaning perfectly clear, so that his shortcomings in the literary line are not a serious matter. In many cases a man of this sort will give more satisfactory service than one of greater education because he is more able to talk to a workman on his own plane and with a certain amount of sociability, which a man of higher education might have

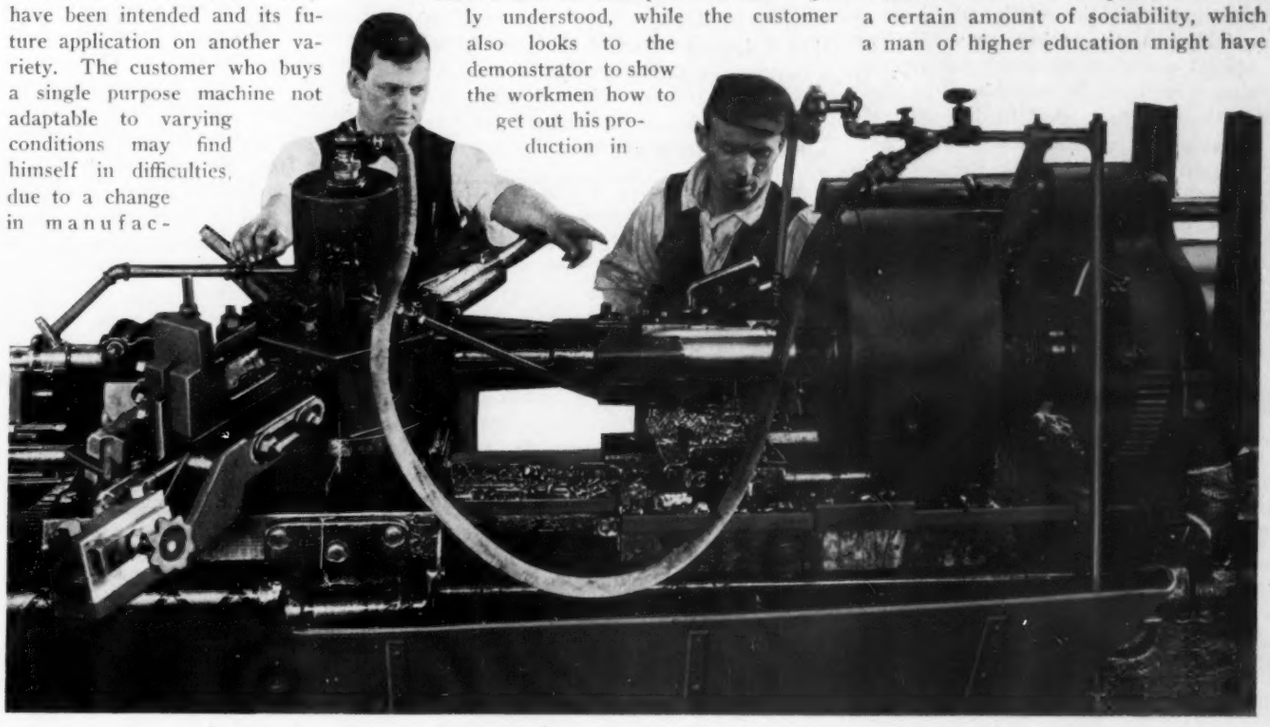


FIG. 1—DEMONSTRATOR SHOWING AN OPERATOR HOW TO TURN HIGH-EXPLOSIVE SHELLS

much more difficulty in assuming. In the event that a demonstrator is a man of ability and one who has received considerable technical training, he must at all times guard against too "high and mighty" an attitude when giving instruction to workmen, for there is nothing more aggravating to an operator than to have the demonstrator act as if he was doing him a favor by showing him how to get out the work to the best advantage. I have known men who were excellent operators, and who were at the same time well educated and thoroughly familiar with the machines on which they operated, yet who made a total failure of demonstrating "on the road" because they seemed unable to get in touch with the workmen with whom they came in contact. In some way or other they seemed to have a tendency to antagonize the men, probably by their general attitude and a feeling that they were somewhat above those whom they were sent to instruct. A good demonstrator must be diplomatic with the officials, careful and painstaking in his work, and friendly with the workmen, in order to give the most efficient service to both his employers and to the customer.

It Doesn't Pay to Show Off

There are really two types of demonstrators; one who manipulates the machines with great rapidity, and who is quick and showy in his movements, yet produces the work rapidly and accurately; the other of a more easy-going type, who seems not to hurry and yet gets the work out just as quickly as the other man. To an official or other observer the impression produced in watching the first of these men, is that he is extremely capable and without doubt an expert operator. He produces the work in something less than the estimated time, but appears to do it largely by his own efforts, so that the question is likely to arise in the mind of the observer, whether an ordinary workman will be able to equal the production desired. The other man seems very deliberate in his manipulation of the machine and leaves the impression that he could get the work out considerably faster if he wanted to. Yet if careful note of his movements is taken, it will be seen that although he may appear to be working somewhat slowly, he makes no false moves, and the machine itself is really doing the work in the quickest possible time. A demonstrator of this kind is particularly careful to have everything in its place so that he can lay his hands on it at a moment's notice and in setting or removing the work, everything is done with mathematical accuracy.

In reality a man of this kind has developed his ability to such an extent that he almost forms a part of the machine on which he is at work and his movements are almost as carefully timed as are the revolutions of the spindle. I remember a case some years ago, when a competitive test was being made on a number of motor shafts, to determine the relative advantages of two methods of handling. I kept an itemized record by stop watch of the various operations on each of 25 pieces of shaft. The operator was the man to whom I have referred and the record was started after he had made a short run to get the tools and himself in proper working condition. The total length of time for the run of 25 shafts was one hour 36 minutes, and after he had produced the first six pieces, the remainder were run off with almost mathematical accuracy. Variations in production time for each piece and each operation were a matter of a very few seconds and in a number of instances during the last part of the run, there was no appreciable difference in the time of production. The general manager who was interested in the test, after watching the work for a little while, made the remark that "Bill ought to be shipped with the machine as he certainly was a part of it". To any ordinary observer, however, it would not have been apparent that "Bill" was working particularly hard, because his movements were so carefully timed and without useless motions. It is very evident that a demonstrator of this type gives a better idea of the possibilities of the machine than one who, through his very evident exertions, produces the work in the required time.

Testing Equipment Before Shipping

In some cases when special equipment is ordered, to go with a machine, it is tested out at the factory before shipping, but in other instances it is shipped after the machine has gone or it may have been designed for some machine already in the hands of the customer. In the latter case, the demonstrator who is sent out to test the equipment has to do it at the factory where it is to be used, and perhaps do some fitting at the same time to adapt it to an old machine. So it will be seen that in addition to being a good demonstrator, he must also be a good all around mechanic. As a usual thing it is considered advisable to test out special equipment before it is shipped and when this is to be done the demonstrator is generally called upon to make the test, under the supervision of the sales engineer who designed the equipment and made the estimates of production. There are a number of advantages in this method of procedure, for it not infrequently happens that certain points in construction need changing, perhaps to avoid danger from interferences or to make the equipment more efficient. It is also an advantage to determine whether the estimated production can be made without difficulty, and it is much better to ascertain these points at the home factory, rather than to find out your troubles under the eye of a customer. The sales engineer and the demonstrator can always work together to their mutual advantage, one man's ideas supplementing the other's.

When the Demonstrator Gets Busy

Let us suppose that a machine has been ordered with special equipment, and has been tested out at the home factory before shipping and found satisfactory. After it has been received and set up at the customer's plant, the home factory is notified and the demonstrator sent on to get things started in good shape. On his arrival at the factory, he puts on his overalls and jumper, and accompanied by one of the officials, is taken out into the shop where the machine has been placed and is introduced to the foreman of the department. If he is a careful man, he will first look into the manner in which the machine has been set up and will make sure that it is leveled up properly and secured to the floor firmly. He will also note whether the belting is such as the requirements of the case call for, and will see to it that no old and oil-soaked belt is used. If the machine is of the motor drive type, he will not omit looking into this feature of the case. Let us suppose that he finds things in good order and the machine all ready to be run; his first step is to go all over the machine and supply the various bearings with lubricant; then he starts the machine and lets it run idle for a time, making an occasional inspection to see whether any of the bearings are "running hot". While the machine is running idle to warm it up, the demonstrator unpacks the special tools and places them in position ready for work. If the machine is a turret lathe and the equipment has been tested before leaving the home factory, the greater part of the tools will be already set to cut the proper sizes and will only require very slight adjustments if any, so that the demonstrator will soon be able to get to work. He gets a few castings from

the foreman and machines two or three pieces to "get his hand in", after which he says he is ready to demonstrate the machine.

The customer is informed that everything is in readiness for the test and comes out into the factory to witness it. A pile of castings has been conveniently placed to the operator's hand and he immediately "gets busy" with the work, getting out the production well within the time estimate and apparently without undue effort. After a few pieces have been finished the customer says he is satisfied that the machine is capable of doing the work but that he would prefer to see one of his own workmen operating it, as he would then feel sure that no trouble would be experienced due to a green operator. Accordingly the demonstrator is called upon to break in a man on the new machine, and the one selected is naturally the operator who has been engaged in producing the same work on another machine. Now right here is where the demonstrator's diplomacy is called upon, for it is not unlikely that the new method and new machine with special equipment will institute a considerable cut in piece work prices and for this reason the new operator's attitude will be antagonistic. He will feel that the installation of the new machine is a direct blow to the previous good prices which he has been receiving for the work, so that he can hardly be blamed for feeling a trifle "sore". As a consequence he acts rather sullen and does not seem to wish to take hold of the work as a progressive operator should. The demonstrator understands his attitude thoroughly and makes no attempt to convince him in regard to the efficacy of the new equipment, but simply shows him the general points in construction and manipulation of the machine; directs him in the use of feeds and speeds and finally leaves him to himself for a while to grow accustomed to the new work. After a time he comes back to see what progress is being made and finds the operator removing a tool from a special holder, preparatory to regrinding it. An inspection of some of the other tools shows the demonstrator that they have been misused and yet the operator says he has used the feeds and speeds that he was told to. After a half hour's work grinding and re-setting the tools, the machine is once more in operation.

This time the demonstrator watches the methods used and observes that the workman continues in a sullen mood, without apparent interest in his work or much attention to the action of the tools. A hard casting is encountered, yet he makes no comment nor does he reduce the speed of the machine. At this point the demonstrator feels called upon to pass a few remarks to the effect that he should reduce his speed in a case of this kind. The operator remarks that if he does so the work will not be produced in the required time. The foreman, having noted the circumstances, steps up and asks what the trouble is, and whether the machine with a new operator is not going to produce the work within the time limit? The demonstrator answers the question by asking the foreman if the castings on that particular piece have an inclination to "run hard", and is informed that "they have to take the castings as they come, whether hard or soft, sometimes they come one way and sometimes another". Noting from his attitude that the foreman also for some unknown reason, is not particularly in favor of the new machine, the demonstrator seeks the superintendent with a request to be informed whether or not the foreman is in any way interested in piece work prices. He is informed that a certain percentage of the bonus made by the men is added to the foreman's salary, so that he is somewhat interested in the amount of work turned out because a high production gives him considerable extra "pocket money". A further inquiry shows that the rate of production expected from the new machine is about double that of the old, and that as a consequence the piece work prices will suffer a corresponding drop so that the foreman

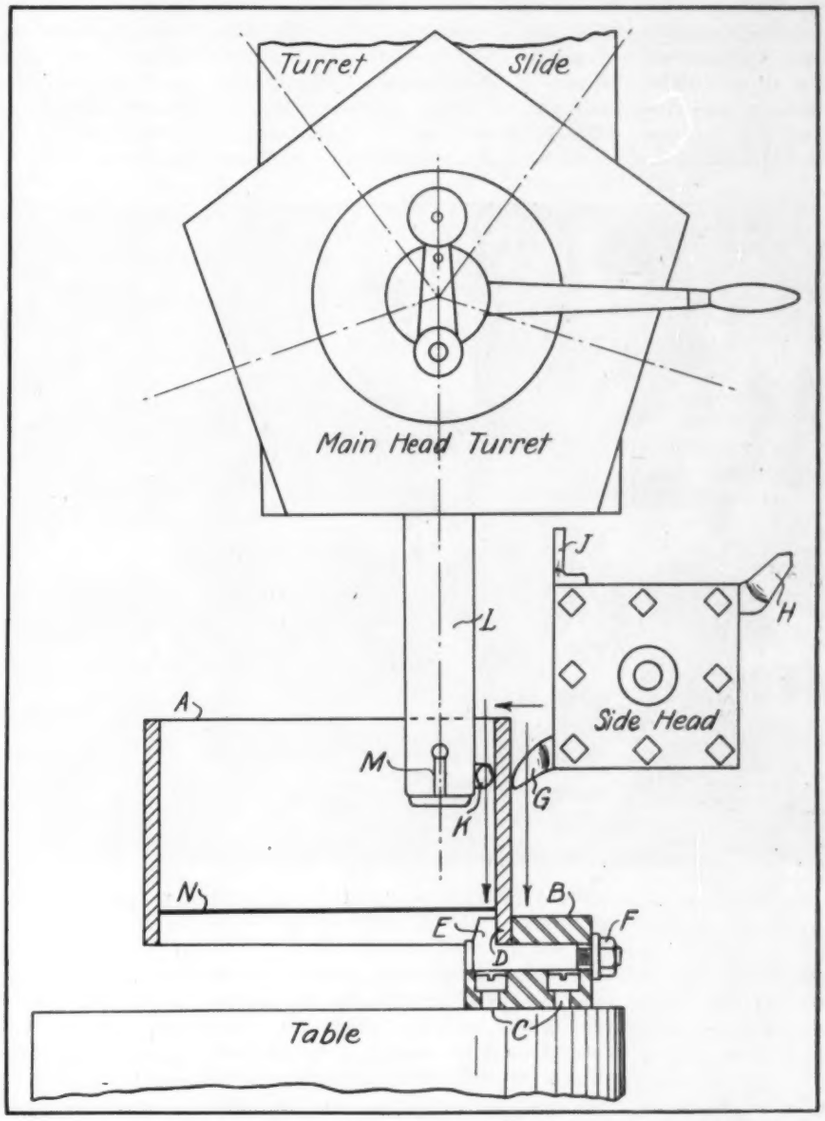


FIG. 2—SET-UP OF A JOB THAT GAVE THE DEMONSTRATOR TROUBLE

evidently thinks it will affect his pocketbook to a certain extent, which is undoubtedly the reason why he is not enthusiastic over the new machine. As it is very evident that something must be done to counteract the prevalent feeling, the superintendent has a little talk with the foreman in which he impresses upon him the fact that in order to compete with other manufacturers improved methods of handling are necessary, and also gives him to understand that although the piece work prices will undoubtedly be cut, still the increased production possible by the use of the new machine will so even matters up in all probability that there will be a gain in pocket to both the workman and the foreman. He tells the foreman in a way not likely to be misunderstood that he must make these matters clear to the workman so that no further trouble will be experienced.

Showing-Up the Machine

A short time after this the demonstrator again goes out "on the job" and finds a somewhat different state of affairs and a different attitude on the part of both foreman and operator. He also finds that a number of the hard castings have been sent back to the foundry to be sand-blasted as they should have been in the first place, and he very strongly suspects that some of these castings were intentionally left in a bad condition to make the showing of the machine as poor as possible. Another day is profitably spent with the new operator in giving him points in the handling of the machine, and seeing "on which side his bread is buttered", the man proves capable and industrious and a good workman. When the demonstrator is ready to leave the factory, he feels confident that the machine will be run as well as if he were there himself. The superintendent is well satisfied and everybody is happy.

Another Cause of Trouble

It will be seen from the foregoing example, that the life of a demonstrator is not exactly a bed of roses, and that in order to give the most efficient service to his employers, he must analyze conditions as they present themselves, and govern his actions in accordance with the circumstances of each particular case. It is not always the case that the fault lies where it did in the instance noted, because an operator is occasionally found who seems not to grasp a new idea readily and who will persist in doing something wrong although he is carefully instructed just how to do the work. Fig. 2 illustrates a case which was very troublesome, simply on account of the operator's lack of sensitiveness. The cast iron sleeve *A* is finished all over, and had been originally made up as a two-setting job, being first bored to size, using several cuts to avoid distortion of the thin section, afterward finishing the exterior and facing the ends of the work on a specially constructed arbor, to insure concentricity.

The new method involved the use of another pattern, a trifle longer than the desired length of the work, as shown in the illustration and a set of special hook-bolt jaws, *B*, was provided to hold the piece without distortion. These jaws were bolted to sub-jaws in the table by the screws, *C*, and the portion *D* was brought up lightly against the outside of the pot casting, in order to center the casting. After this the hook-bolts, *E*, were tightened by the nuts at *F*, thus holding the piece firmly. A boring bar, *L*, was held in the main head turret and supplied with interchangeable tools, *K*, for roughing and finishing the interior of the shell. The exterior turning and facing the upper end was done by the two tools, *G* and *H*, in the side head, while the parting tool, *J*, was used to cut off the finished portion of the ring at *N*, thus completely finishing the work in one setting.

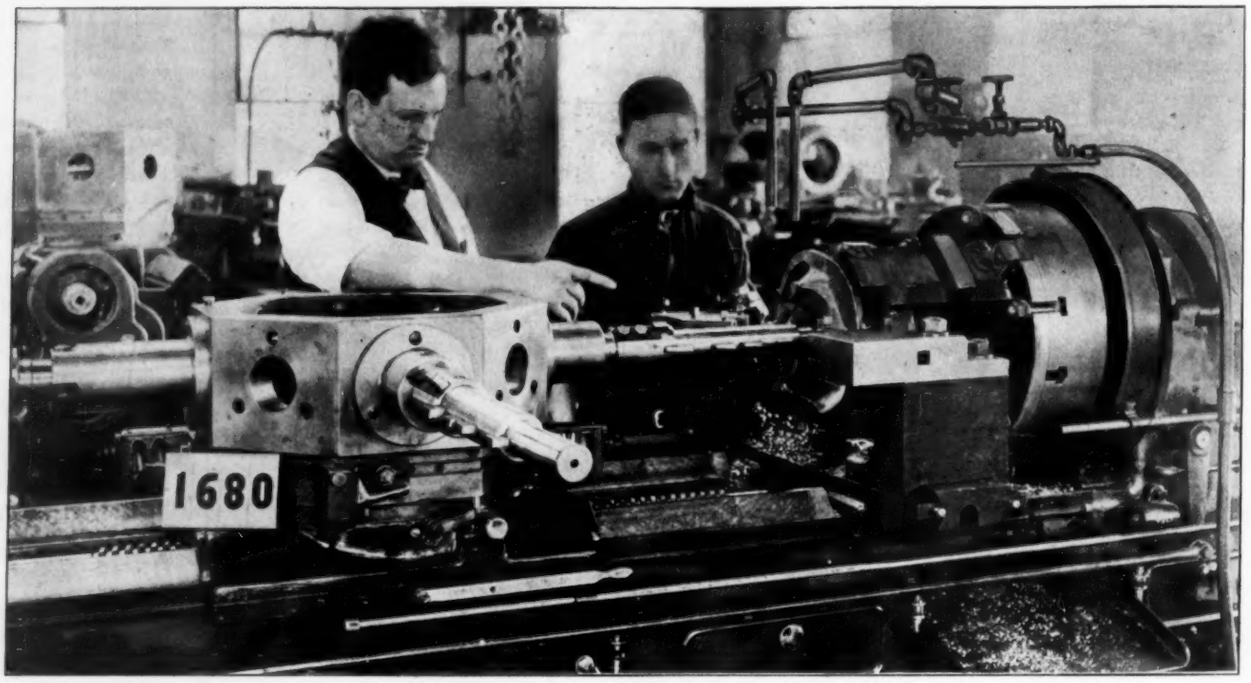


FIG. 3—THE MACHINE IS STOPPED WHILE THE DEMONSTRATOR EXPLAINS THE FUNCTIONS OF THE BORING BAR TO THE OPERATOR

Up Against a Green Hand

In testing out and demonstrating the equipment at the customer's plant, a comparatively green hand was selected to be broken in on the job, and the demonstrator spent considerable time in explaining the working of the machine and equipment to him so that he apparently understood it. The boring bar, *L*, was a type having slip cutters and a floating reamer blade at *M*, which was obviously not

used for this piece of work, but it was pointed out to the operator that the turning tools, *G* and *H*, and the boring tools, *K*, should always be working together in order to support each other and prevent distortion of the work. The importance of bringing up the chuck jaws very lightly at *D* was emphasized, and the operator seemed to comprehend just what was needed.

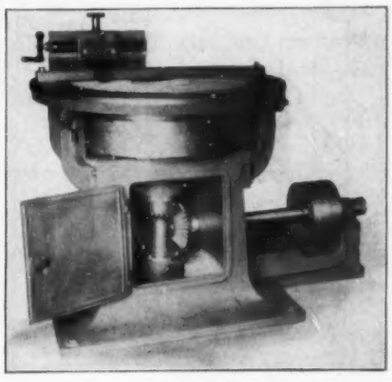
After he had been left for half a day to familiarize himself with the machine and equipment, the demonstrator came around to see how matters were progressing. In looking over the work which had been done during the day, he found several finished pieces with a slightly relieved portion on the outside and found by calipering that the work was oversize a few thousandths on the unrelieved part. He called the operator's attention to the matter and told him that the trouble was caused by not having the boring and turning tools opposite each other and by starting one tool in advance of the other. Having impressed this upon the operator, the demonstrator made a more careful inspection of the rest of the work and found several of the pieces considerably out-of-round. As this was undoubtedly caused by setting up the jaws too tightly before bringing up the hook-bolts on the inside, the operator's attention was once more called to the importance of this feature of the case.

How The Difficulty was Overcome

The demonstrator kept closely in touch with the new man, and several times caught him setting up the jaws too tightly, not apparently by intention but seemingly because he didn't realize how powerful a pressure was being exerted, and seemed to lack sensitiveness in his muscles. As he seemed to be doing his best, the demonstrator decided that the man really was unable to tell by the "feeling" whether he had the jaws set up too tightly or not. The difficulty was finally overcome by telling him to set the jaws in such a way that he could just manage to revolve the work in the jaws, by taking hold of it with both hands, and then to tighten the hook bolts. After this there was no further trouble with the equipment and the work was produced both accurately and in good time. So it will be seen that in some cases, although the operator may be willing enough, he may lack skill, so that the demonstrator's function is called into play to bring about the desired results.

Fig. 1 shows the demonstrator instructing a workman in the use of special tool equipment for 18-pounder British high-explosive shells on a 21-inch semi-automatic Gisholt turret lathe. He is pointing out the purpose and use of the copper band groove cutting tools seen in operation. This photograph is especially interesting at this time on account of the number of machines being sold for foreign service. Fig. 3 shows a Gisholt 20-inch automatic at work on an automobile rear axle housing, with special equipment. The boring bar has just entered the work and the demonstrator has stopped the machine to explain to the operator the function of both the bar and its adjustable cutters which are clearly shown in the illustration.

It will be readily seen that the demonstrator's services are of great value to both the manufacturer and to a customer who has installed a new machine tool, but in addition to the services mentioned, he is of value also at the home factory in a number of ways. First, as a good workman, and a



NEW TYPE OF UPRIGHT SURFACE GRINDER SHOWING BEVEL GEAR DRIVE AND ALSO SLIDE REST FOR USE IN TRUING FACE OF WHEEL

man who understands the machine thoroughly, he is often able to suggest improvements in the design and general construction both of the machine itself and also of special tooling or attachments. In the regular production work of the factory his experience is often useful, perhaps in breaking in new operators or in collaboration with the foreman, suggesting better methods of handling so that greater efficiency will be obtained.

The Demonstrator at the Home Factory

In a number of instances prospective customers visit the factory before making a purchase and it is only natural that they should wish to see some of the machines in operation. The demonstrator is therefore often called upon to put a machine through its paces for the benefit of a customer or a prospect. Usually several demonstrators are engaged in production work or something of the kind when they are not out on the road, and can therefore be used to advantage in cases of this kind. Many a customer has come into a factory without a fixed intention of buying a machine, yet has been so pleased at the demonstration that he determines to purchase at once.

So it will be seen that the services of the demonstrator are of the greatest value to both manufacturer and customer, and that he is in a great degree responsible for the success or failure of a machine and its equipment.

Upright Surface Grinder

The Bridgeport Safety Emery Wheel Co., Bridgeport, Conn., has put on the market a new type of upright surface grinder, designed to grind flat surfaces on work which can be held by hand or laid on the grinding face of the wheel. The wheel is held in a chuck of an improved type recently developed by the company. The body of the chuck is a steel casting whose inner surface is turned to a uniform taper and is provided with a number of jaws for holding the emery ring in place. These jaws are operated by a screw located at the back of the body casting; side guides are riveted on the inside of the chuck to hold the jaws in the correct position at all times. The body casting is provided with a hub, which is splined to the spindle and which is sufficiently long to maintain perfect alignment. To the outside of the hub is screwed a back plate whose function is to take the end thrust of the work against the wheel; this back plate may be elevated to compensate for wear on the face of the wheel, the jaws being released during this operation and the spindle locked by sliding a pin, located in the base. The chuck is mounted on a steel spindle having large bearings. The top bearing is provided with taper bronze bushings and lock nuts to adjust for any wear that may occur in time. The lower bearing is equipped with a radial and a ball thrust bearing. A light weight octagon nut is screwed on the end of the spindle, against the hub of the chuck. The spindle is operated by a set of bevel gears, the gear on the horizontal shaft being of fiber, to insure silent running. A circular table, on which the work may be rested, surrounds the grinding wheel. Bolted across the top of this table is a steel bar, to which a slide rest may be attached for truing the face of the wheel. The bar also serves as a stop for the work.

Comparison of Heat Treated Steels

A Discussion of the Properties of Nickel, Carbon and Manganese Steels Before and After Heat Treatment

BY ROBERT R. ABBOTT

THE EFFECT of small quantities of manganese upon the physical properties of annealed steel is fairly well known. Up to about 2 per cent each 0.01 per cent of manganese increases the tensile strength by about 160 pounds to the square inch. Its effect upon the reduction in area and elongation is very small, slightly increasing the reduction and lowering the elongation. From about 2½ per cent to 7 per cent, manganese makes steel extremely brittle and above 7 per cent this effect disappears and we again have a useful alloy. An 11 per cent alloy has a wide range of use in the cast form for crossing frogs, rolls, gears, etc. It is usually finished by grinding as it is nearly impossible to machine.

We can classify the average commercial steels made in this country with carbon less than 0.50 per cent into two groups: (*a*) Those with manganese contents approximately 0.40 to 0.50 per cent; this group including the ordinary carbon steel and chrome-nickel steel; and (*b*) those with manganese contents approximately 0.60 to 0.70 per cent; this group including nickel and chrome-vanadium steels.

I do not mean the above as a hard and fast classification, but it represents fairly well commercial practice. English steels fall readily into the same classification, but with German steels the grouping is not so well defined.

Very little has been published regarding the heat treatment of high manganese steels and I am therefore presenting a comparison of the effect produced upon the physical properties of three steels of about the same carbon content. One of these is a plain carbon steel, another a nickel steel, and the third a manganese steel, containing 1.61 per cent manganese. The analysis of these steels is as follows:

	Carbon steel.	Nickel steel.	Manganese steel.
Carbon	0.342	0.336	0.341
Phosphorus	0.014	0.019	0.047
Sulphur	0.029	0.019	0.025
Manganese	0.54	0.55	1.61
Silicon	0.030	0.188	0.009
Nickel	0.0	3.17	0.0
Chrome	0.0	0.0	0.0
Vanadium	0.0	0.0	0.0
Copper	0.0	0.005	0.02

In these three steels the upper critical temperatures were first determined. Test bars ¾ inch in diameter and 4½ inches long were next machined from each steel; one of each kind was annealed by heating in lead to a temperature 5 degrees Fahr. above the upper critical temperature, holding there about ten minutes, and allowing to cool slowly until the lead solidified. The time of this cooling was about ten hours. The lead was then heated slowly to a temperature of 800 degrees Fahr. and the test bars removed. They were then threaded and machined to a standard 2 inch test specimen and ground to a diameter of 0.505 inch. One end was left longer than the other to allow for hardness tests. They were then pulled in a tensile machine with the following results:

	Carbon steel.	Nickel steel.	Mang. steel.
Elastic limit, pounds.	36,600	55,000	61,150
Maximum strength, pounds	67,250	81,850	87,850
Reduction in area, per cent	51.0	59.0	58.5
Elongation, per cent	32.0	31.2	29.9
Brinell hardness No.	120	153	150

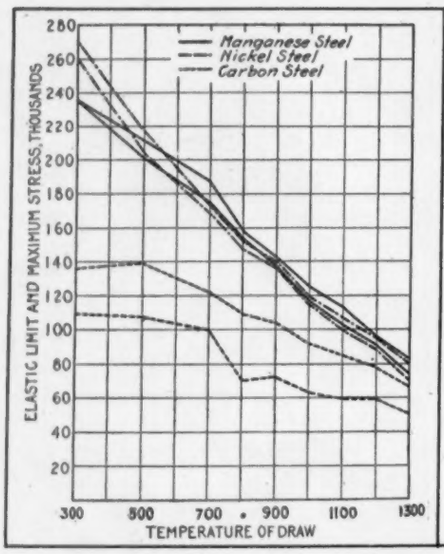


FIG. 1—ELASTIC LIMIT AND MAXIMUM STRENGTH TESTS

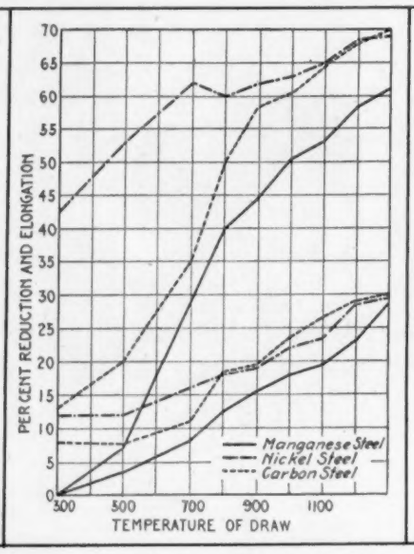


FIG. 2—REDUCTION OF AREA AND ELONGATION TESTS

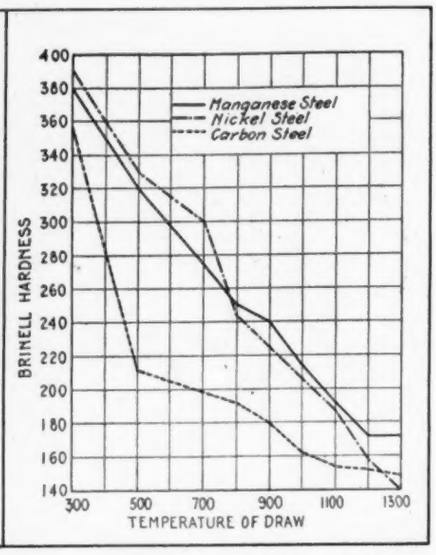


FIG. 3—BRINELL HARDNESS TESTS

From these figures we perceive that the manganese steel is slightly stronger than the nickel steel and has practically the same amount of "toughness" as shown by the reduction in area.

For the heat-treated specimens a test bar of the same size was used. The heating was all done in lead and was controlled by a Leeds & Northrup resistance pyrometer.

The test bars were quenched in water and were drawn to the desired temperature in a lead furnace holding about three tons of lead. All of the bars which were to be drawn at the same temperature were drawn simultaneously. The desired temperature was maintained constant for 30 minutes. The large mass of lead made this an easy matter. After treatment the bars were machined and then ground to a diameter of 0.505 inch and were pulled

Presented at the spring meeting, Buffalo, N. Y., June 23, of The American Society of Mechanical Engineers. The author, R. R. Abbott, is metallurgical engineer, Peerless Motor Car Co., Cleveland.

in a tensile machine with an autographic recording device. Hardness tests were made on the long end of the test bar after sawing off and grinding to a flat surface. The following determinations were made: Elastic limit, maximum strength, reduction in area, elongation, Brinell hardness, scleroscope hardness, rupture stress and energy in foot pounds necessary to cause fracture. The last three determinations are not considered in this article. Test bars

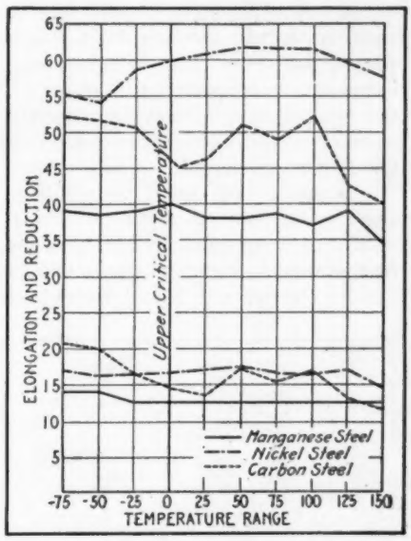


FIG. 4—EFFECT OF OVER AND UNDER HEATING ON DUCTILITY

were treated from above the upper critical temperature and were then drawn to the following temperatures: 300, 500, 700, 800, 900, 1,000, 1,200, 1,300 degrees Fahr.

In Fig. 1 are plotted the results of these tests for the three steels for the elastic limit and maximum strength. In Fig. 2 the results are given for the reduction in area and elongation, and in Fig. 3 are given the Brinell hardness results.

Results Plotted

From these charts it can be concluded that practically the same results can be obtained as far as strength is concerned, by the heat treatment of a 1.6 per cent manganese steel as for a nickel steel of practically twice the per cent of nickel. However, since the nickel steel also contains 0.55 per cent manganese we actually have an excess of only 1.06 per cent manganese which apparently has the same effect as about three times the same amount of nickel.

Now, regarding the "toughness" which for the sake of comparison can be considered as being measured by the reduction in area, we see that the manganese steel does not compare so favorably with the carbon or nickel steel for the same temperature of draw. Evidently also, while manganese increases the reduction in area in annealed steels, it has the opposite effect in heat-treated steels.

The following equations represent fairly well the average values of the elastic limits, maximum strengths, reduction in area and elongation of the three steels.

E = elastic limit in pounds per square inch.
M = maximum stress in pounds per square inch.
r = reduction in area in per cent.
e = elongation in per cent.
T = temperature of draw in Fahr.

For manganese steel

$$E = 284{,}000 - 163\,T$$
$$M = 288{,}000 - 159\,T$$
$$r = -19 + .068\,T$$
$$e = -10 + .028\,T$$

For nickel steel

$$E = 302{,}000 - 183\,T$$
$$M = 314{,}000 - 188\,T$$
$$r = 40 + .024\,T$$
$$e = 3.5 + .018\,T$$

For carbon steel

$$E = 134{,}000 - 66\,T$$
$$M = 170{,}000 - 77\,T$$
$$r = -5.8 + .063\,T$$
$$e = -3 + .026\,T$$

The next determination was upon the effect of over and under heating during the quenching process. For this purpose ten bars of each steel were quenched as follows: One 5 degrees above the upper critical point, six others at 25, 50, 75, 100, 125 and 150 degrees above and three at 25, 50 and 75 degrees below the critical point. These were all drawn to a temperature of 800 degrees Fahr. and the regular tests conducted upon them. The results of these tests are plotted in Fig. 5 which gives the elastic limit and maxi-

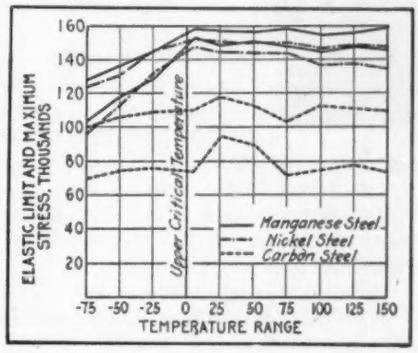


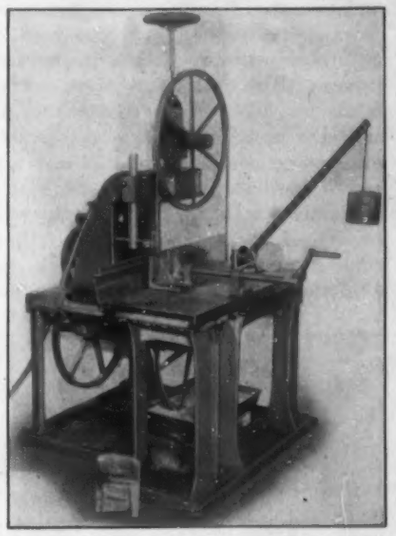
FIG. 5—EFFECT OF OVER AND UNDER HEATING ON STRENGTH

mum strength, and in Fig. 4 which shows the reduction and elongation.

These tests show that there is very little difference between the nickel and manganese steels as far as over and under heating is concerned.

Briefly summarizing the above results: For a heat-treated 1½ per cent manganese steel the manganese in excess of that contained in a nickel steel of a corresponding carbon content (about 0.34 per cent) exerts a strengthening effect equivalent to about three times the same amount of nickel.

While the manganese effect upon a steel which has not been heat-treated is to increase the toughness slightly, its effect upon a heat-treated steel is decidedly the reverse. In the case of nickel the effect upon an untreated steel is practically zero, while in a heat treated steel nickel increases the toughness decidedly. An untreated steel containing about 1½ per cent manganese



NOVEL BAND SAW FOR CUTTING METAL

is fully as tough, and is stronger than a nickel steel of about 3¼ per cent nickel.

New Metal Band Saw

A new metal band saw has been placed on the market by H. C. Williamson, Chicago. It is designed to cut round or square bars, or I-beams up to 8 inches. Tubing and light material also can be handled on this machine, the back of which is removable, presenting a flat table for special work. This table is stationary, so that heavy bars need not be moved to the blade. The frame which carries the wheels, saw, and driving mechanism, slides on a track as shown in the accompanying illustration, and may be operated by hand or by an automatic gravity feed. The saw guide is located so as to facilitate adjustment. The saw pressure is varied by hanging weights on a lever. When motor drive is used, the motor is mounted on the frame, which is self contained. The blade is tightened by a hand wheel. One operator, it is said, can run several machines at the same time. The table is 26 inches from the floor, facilitating the handling of heavy material. The saw will not handle pieces more than 20 inches long.

A New Machine for Lapping Tests

Description of a Device for Testing Laps With Results of an Investigation of Different Methods and Abrasives

BY W. A. KNIGHT AND A. A. CASE

THE USE of a loose-grained abrasive in connection with a lubricant, for working down surfaces, dates back to the remotest times. This method was first used in the grinding and polishing of precious stones. The workmen were called lapidaries and their tools, charged with the abrasive, called laps. Later the process was applied to the working of hardened steel and, from this, gradually extended to cover a wide variety of operations common to machine-shop practice.

Several years ago, having occasion to seek definite information on the subject, it became evident that there were few, if any, exact data available. This led to the construction of a machine with which quantitative results could be obtained with various combinations of abrasive lubricant and lap material. Tests on the machine were confined to surface lapping.

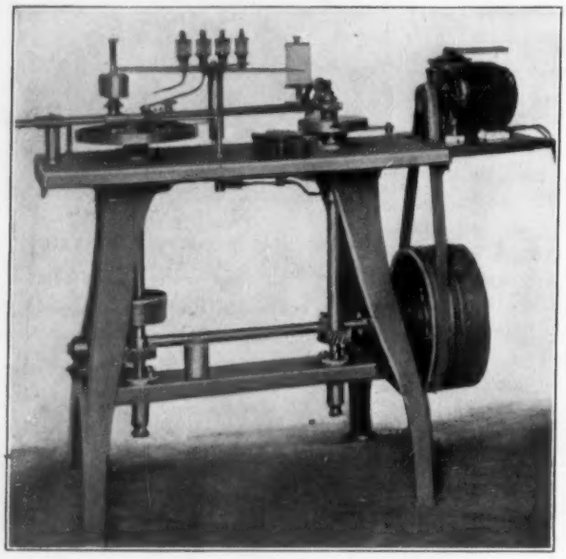


FIG. 1—MACHINE DESIGNED FOR LAPPING TESTS

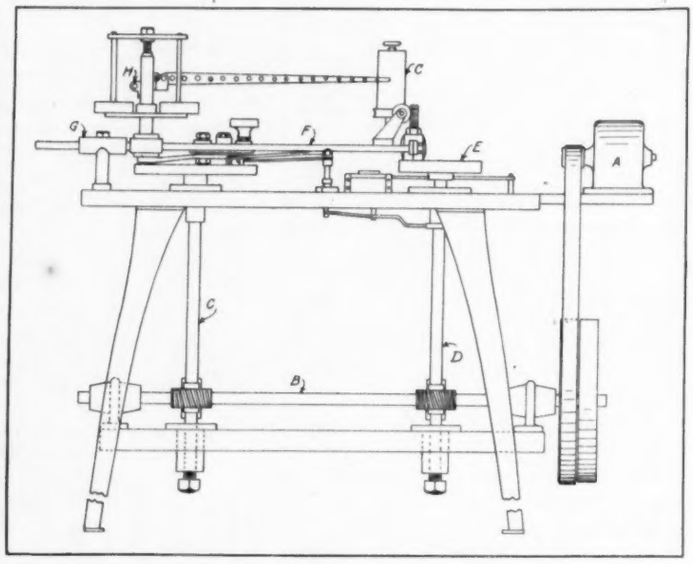


FIG. 2—SIDE ELEVATION OF MACHINE

Methods of Surface Lapping

There are two methods of using a surface lap which, for want of better definitions, will be termed the "wet" and the "dry" methods. In the wet method there is a surplus of oil and abrasive on the surface of the lap. As the specimen being lapped is moved over it there is more or less movement or shifting of the abrasive particles. The action may be conceived to be somewhat as follows: A particle becomes embedded in the softer surface of the lap, remaining stationary for a while, but is finally dislodged by friction or change in direction of the rubbing surface. It then rolls around for awhile, only to lodge again and have the process repeated. Meanwhile the grains of abrasive are being broken up into smaller sizes, their sharp edges and corners worn away, the cutting effect growing less, until it becomes necessary to recharge the lap with fresh material.

With the dry method, the lap is first charged by rubbing or rolling the abrasive into its surface. All surplus oil and abrasive is then washed off, leaving a clean surface, but one that has embedded uniformly over it, small particles of the abrasive. It is then like the surface of a very fine file or oil stone and will cut away hardened steel that is rubbed over it. While this has been termed the dry method, in practice the lap surface is kept moistened with kerosene or gasoline. This is for the purpose of preventing small spots of steel, called "birds eyes", from building up on the lap surface. But there is not enough lubricant applied to "float" the piece being lapped and, hence, it has been called the dry method.

Among mechanics there is some difference of opinion as to whether the cutting is more rapid with the wet or the dry method. By advocates of the dry method it is pointed out that in this the abrasive is permanently embedded in the lap surface, there is actual contact between the abrasive and the steel specimens, there is no floating on an oil film, no rolling on loose particles, that the cutting action is more nearly true, and hence more rapid than when these dry method conditions fail to obtain. Materials used for laps may be cast iron, copper, steel, tin, lead, or any combination of the softer metals to give varying degrees of hardness. The choice depends on first cost, permanence of form, rapidity of cutting and ease of redressing.

Lubricants in Common Use

The lubricants most commonly used are lard and machine oils, kerosene and gasoline. Alcohol and turpentine have been recommended. It is well known that turpentine can be used to advantage when drilling hard steel. It causes the drill to "take hold" of the steel better. Whether it has a similar effect when hardened steel is cut by an abrasive is a question.

Abrasive materials are usually

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emery, alundum, corundum, carborundum, or others of a similar kind, but sold under various trade names, as Crystolon, Axolite, Carbondite, etc. Diamond dust is also used and ground glass, oil stone powder, and ground pumice stone find limited application for certain kinds of work.

Description of Testing Machine

The machine which was designed and used for the author's tests on lapping is shown in Figs. 1 and 2. The horizontal shaft, *B*, driven by motor *A*, transmits motion through spiral gears to two vertical shafts, *C* and *D*. Shaft *C* carries the lapping plate at its upper end and shaft *D* the slotted crank disc, *E*, by means of which, and the connecting rod *F*, the specimen holder *H* is made to reciprocate between the center and outer edge of the lapping plate. The motions of the lapping plate and specimen holder cause the latter and its

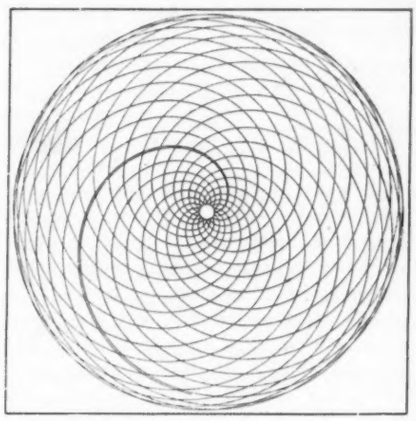


FIG. 3—OUTLINE TRACED BY MACHINE

specimen to follow a path relative to the plate like that shown in Fig. 3, which is from a figure actually drawn on the machine. Originally the plate made about three revolutions to one of the crank disc, but this was changed to about 1.8:1, which gave better results.

As at first constructed the machine was autographic, but too many uncertainties were introduced by the friction of the pencil and other conditions and this feature was finally abandoned.

The specimen holder is shown in section in Fig. 4. The specimen is held in the hardened steel bushing *O* in end of lever *L*, which receives its motion through connecting rod *F*, to which it is attached by studs *M* and *N*. The specimen is held against the lapping plate by the pressure of the weights shown in the figure, which is transmitted to the specimen through the yoke *E*, screw *S* and pin *J*. These parts are supported by a tube *A* held by the split block *B* which in turn is clamped to the connecting rod *F*.

The nut *D*, through which passes the screw *S*, is of tool steel, hardened, ground and lapped to a smooth working fit in the tube. At *K* is a hardened steel plug, which is also a smooth working fit in the tube. This plug has a conical seat at each end in which bear the tapered ends of screw *S* and pin *J*. The object of this construction is to allow a slight lateral movement of the specimen without disturbing the alignment or in any way increasing the friction of the moving parts in the vertical tube. A perfectly free vertical motion is thus obtained whereby the weights can follow up the wear of the specimen with practically no friction.

The bushing *O* which carries the specimen is counterbored in order that any side thrust may be brought as near the lower surface of the specimen as possible. In order to move the specimen from under the tube for examination or removal, the knurled nut *N* is loosened, thus permitting the arm *L* to be turned about the stud *M*.

It was the original intention to have the specimen carried directly in the vertical tube, but after some experience with this and several other forms they were discarded. The present holder was developed as a result of experience gained during the preliminary stages of the work.

The Lapping Plate

The lapping plate is shown in section in Fig. 5. The lap surface is at *A*. A gray iron plate, cast originally ½-inch thick and finished down to ⅜-inch thick, is held to the lower plate *B* by means of screws. The outer rim *C* is also fastened by screws and is removable.

At first it was attempted to use a plate cast in one piece, but it was found that it was more porous near the center than at the edge and further that it was impracticable to face the plate in a lathe without leaving pit marks in the surface. Obviously these conditions would produce unsatisfactory results and it was, therefore, decided to use a removable upper plate of uniform thickness which would be practically uniform in texture and could be readily finished to a true surface, clear to the edge, by grinding.

Five plates were cast from the same heat, so if one or more developed defects or was worn out, another of the same metal could be substituted. The plates were of a good grade of foundry iron, but no attempt was made to get a special mixture. The copper and steel laps were built up the same way. Each consisted of a cast iron backing plate faced with its proper material. The copper plate was made of plate copper, ¼-inch thick. Since this was too thin to be tapped into, it was secured to the cast plate by means of solder. The steel plate was made of fire box steel, ¼-inch thick, and secured in the same manner as the copper plate. Like the cast iron plate, the surfaces of these were finished by grinding.

The Distributor

The distributor, or wiper, is an important feature of the machine. Referring to Fig. 2, this will be seen at *T*, and is shown more in detail in Fig. 6. It was essential that there be a uniform distribution of the charge of abrasive over the entire surface of the plate. Centrifugal force was depended upon to work the charge from the center of the plate outward. A wiper, consisting of a strip of wood resting on the plate and inclined at

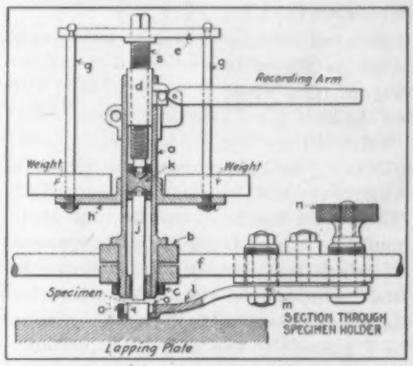


FIG. 4—SECTION THROUGH SPECIMEN HOLDER

an angle of 15 degrees to a radial line from the center, was counted on to shear the charge back toward the center. At times this worked finely, allowing enough of the charge to pass under the wiper to give even and uniform distribution. At other times the wiper would apparently adhere tightly to the plate, wiping it nearly clean and bunching the charge in the center. Notches were cut in the underside of the strip of wood, through which a portion of the charge could always flow. This helped very materially, but the distribution was further improved by giving motion to the wiper. This was effected through the medium of an eccentric *R* placed on the shaft *D*. To prevent an accumulation of part of the charge around the inner surface of the outer ring, a small auxiliary wiper was placed as shown at *Q*. Details of the notched piece of wood are shown in Fig. 7.

The test specimens were of hardened tool steel. It was first attempted to use a hollow specimen of the form

shown in Fig. 8, in order to secure uniformity in hardening and to reduce the tendency to rock while being moved over the lap surface. After many trials this form was given up. It seemed absolutely impossible to duplicate runs with any degree of certainty. The cause of this is not exactly clear, but it may be due to the fact that the surface in contact with the plate being perfectly flat and the edges perfectly square and sharp would allow the specimen to shear the abrasive ahead of it instead of riding over it. The specimens finally used, as shown in Fig. 9, were made of ⅝-inch drill rod. Fifty-five pieces, ½-inch long, were cut from the same bar and numbered consecutively. They were hardened by heating in the muffle of a gas furnace, the temperature of which was regulated by a pyrometer, and quenching in clear water, to which salt had been added to the amount of 3 pounds to the gallon. In conducting these lap tests the authors found that the initial rate of cutting is not greatly different for the different abrasives. Other deductions from the tests are as follows: There is no advantage in using an abrasive coarser than No. 150. The rate of cutting is practically proportional to the pressure. The wear of the laps is in the following proportions: Cast iron, 1; steel, 1.27, and copper, 2.62. This wear is inversely proportional to the hardness of the Brinell test. In general, copper and steel cut faster than cast iron, but where permanence of form is a consideration, cast iron is the superior metal. Gasoline and kerosene are the best lubricants to use with cast iron lap; kerosene, on account of its non-evaporative qualities, being first choice. Machine and lard oil are the best lubricants to use with copper or steel lap. They are least effective on the cast lap. For all laps and all abrasives (of those tested) the cutting is faster with lard oil than with machine oil. Alcohol shows no particular merit for the work. Turpentine does fairly good work with carborundum, but in general is not as good as kerosene or gasoline. Soda water compares favorably with other lubricants. Taken as a whole, it appears to be slightly better than alcohol and turpentine.

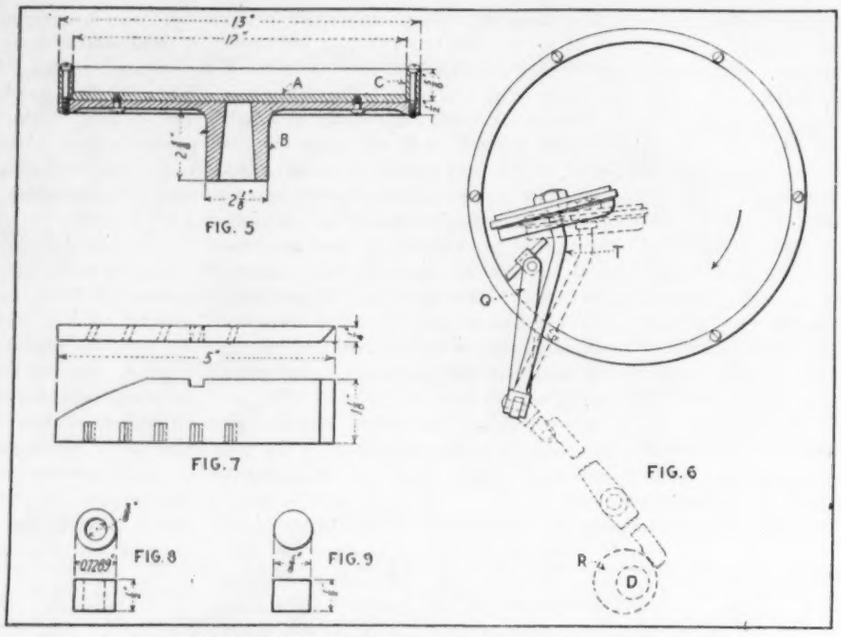
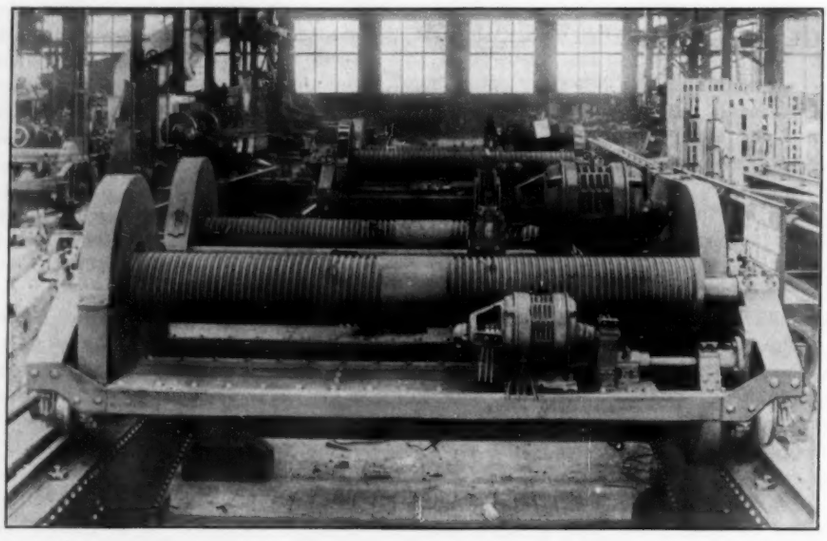


FIG. 5—SECTION THROUGH LAPPING PLATE. FIG. 6—DETAILS OF DISTRIBUTOR. FIG. 7—DISTRIBUTOR SHOE. FIG. 8—TEST SPECIMEN OF FORM REJECTED. FIG. 9—TEST SPECIMEN OF FORM USED

The tests show that wet lapping is from 1.2 to 6 times as fast as dry lapping. This depends upon the material of the lap and the manner of charging.

Novel Use of Cranes in Ford Shops

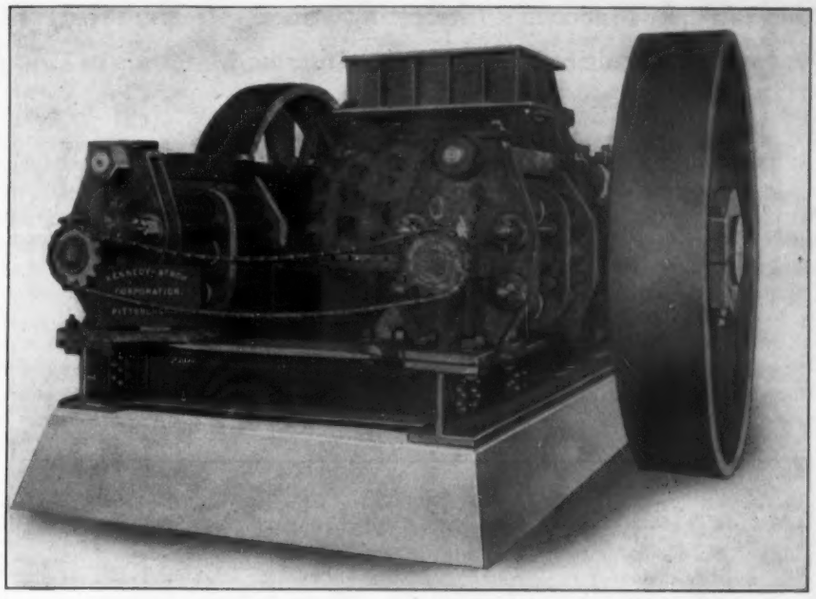
THE Ford Motor Co., Detroit, has purchased a number of electric cranes from the Cleveland Crane & Engineering Co., Wickliffe, O., for use in its Cleveland, Cincinnati, Pittsburgh, Atlanta and Long Island assembling shops. These cranes will be employed in a rather unusual manner, for unloading bulk freight from cars located on the ground level, and for hoisting it to the various shop floors. Loading platforms are placed on each floor in staggered locations, and below the crane runway, permitting the loading or unloading of material at any floor. The accompanying illustration shows the crane trolleys set up on the assembling floor before shipment. The cranes have a capacity of 50 tons on the main hoist and five tons on the auxiliary hoist, with a total possible lift of more than 86 feet. The main hoist has four ropes, which wind on the drums 8 feet apart, to prevent twisting. It is operated by a 40-horsepower alternating current induction motor, a new Westinghouse product, specially designed for crane and hoist service. The bridge and trolley motors, 11 and five horsepower, respectively, are similar to the one used on the hoist.



ELECTRIC UNLOADING CRANES FOR USE IN FORD ASSEMBLING SHOPS

Kennedy Slugger Type Crusher

ONE of the largest heavy duty slugger type roll crushers ever built has recently been completed by the Kennedy - Stroh Corporation, Pittsburgh, and now is being installed at one of the blast furnace plants in the Birmingham district. This crusher is designed for breaking down open hearth slag containing steel in varying quantities in the majority of the lumps. It may also be required to crush blast furnace slag to concrete aggregate and road ballast sizes.



HEAVY DUTY 54 x 36-INCH SLUGGER TYPE CRUSHER WITH ROLL COVERS REMOVED

The design is such that the rolls are in balance and the principal strains are taken entirely by steel members. All of the parts, except the hopper and the hearts, are of steel. The action is in a straight line with the center of the rolls, which tends toward smooth running qualities and to reduce shock and vibration to a minimum, thus, it is said, keeping the maintenance cost at a low figure.

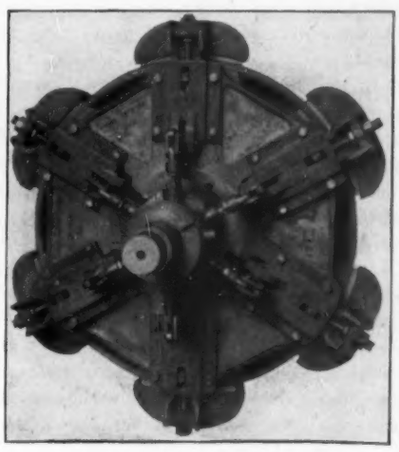
The tires are made of Stroh process steel with the sluggers cast integral. Two important departures from customary forms of construction are found in the bearings and the springs. The bearings, which are interchangeable, are of the ball and socket type, with a machined joint at the ball surface. The bearings are made in halves, with the parting line normal to the direction of the resultant pressure. They are lined with babbitt metal, peened in place, and are bored and scraped to a proper fit with the shafts.

The crusher is provided with four spring cages, each consisting of two heavy cast steel tie plates, provided with separators. In each of the cages, 12 heavy coil springs are held in compression by four steel tension rods. The cages are set in the shop to give the desired crushing pressure on the rolls, but, when pieces of steel or iron enter the rolls with the slag, the springs will deflect to permit the passage of such metallic substances without damaging or clogging the rolls. The springs are designed to permit the rolls to separate as much as 12 inches. It is said that no pressure is exerted on the main journal bearings by the springs, except when the material is fed to the machine, and the springs are not compressed when the machine is operating normally. A heavy steel temper screw extends centrally through each spring cage and abuts against the adjacent bearing. These temper screws are geared together in pairs to permit a parallel adjustment of the crushing apertures without affecting the working pressure of the springs.

A locking device is provided for preventing the adjustment being displaced by the vibration of the machine. Two spreader springs between the bearing on the sides of the roll, serve to keep the bearings in position against the temper screws and prevent chattering when the material passes through the machine. These springs are adjustable so that the machine can be regulated as required for the aperture at which it is set.

New Lehigh Rim Friction Clutch

THE Lehigh Clutch Co., Camden, N. J., has developed the rim friction clutch for transmitting power, shown in the accompanying illustration. The clutch is of the opposite jaw type, each jaw being operated by an independent lever which is connected with the spool by a turnbuckle. This turnbuckle serves to adjust the clutch when the shoe begins to wear. One of the distinctive features of the Lehigh clutch is the method of adjusting each jaw without disturbing any other jaw on the clutch, which tends to insure a positive grip of each shoe on the rim. The wood shoes or friction blocks on any of the jaws can be removed without disturbing the other jaws or without removing the clutch from the shaft. No springs are employed to release the clutch, the jaws being moved by positive connecting levers which are so arranged that the main shifting lever may be operated easily.



RIM FRICTION CLUTCH

The clutch is designed for a wide variety of applications and is said to be particularly suitable for electric drives and for machines where a quick acting clutch is required.

Get the habit of ordering drills by their diameter in decimals. Don't try to remember the numbers of drill gages that never should have been made.

Progress in Blast Furnace Practice

A Discussion of A. E. Maccoun's Interesting Paper—Recent Progress Has Only Overcome Difficulties Due to Use of Inferior Materials in Charge

BY A. N. DIEHL

MR. MACCOUN has discussed blast furnace practice from the raw materials to the finished product, suggesting various improvements to be made in the production of pig iron. I thoroughly agree with him in his outline for future furnace advancement, but desire to emphasize that, after all, are we not only arriving at the same operating practice which up-to-date plants had about 15 to 18 years ago? The desire in the manufacture of pig iron is: *First*—To produce the quality best suited for future use; *Second*—To produce it as cheaply as possible; *Third*—To produce the greatest quantity possible while fulfilling the first two conditions. A three years' average on one of the representative modern furnaces with high heats, conditioned material, and modern equipment, shows a daily production of 529 tons with a coke consumption of 1,925 pounds per ton. This furnace has a limestone consumption of between 800 and 900 pounds per ton, and is producing iron running about 0.04 per cent sulphur. In a few instances, under good conditions, coke consumption has been between 1,600 and 1,700 pounds per ton. This is obtained by the use of coke running about 0.5 per cent sulphur and between 91.00 and 92.00 per cent fixed carbon, together with a coarse washed ore and sinter. The requirements are about 600 to 700 pounds of limestone per ton of metal. This open burden is capable of carrying extremely high heat and serves to illustrate possibilities when properly conditioned material is used. Fifteen years ago there were few so called modern plants with which the present practice could be compared. The Duquesne furnaces of the Carnegie Steel Co. might be termed pioneers in this development. The average practice of these furnaces for the years 1897, 1898 and 1899, and a comparison of Duquesne basic furnace No. 4 with the best practice shown over the years 1912, 1913 and 1914, is shown in Table I. Very little difference in practice is shown. Hand filled furnaces, with the same material as used at Duquesne, and during the same period, will show similar results as far as coke and analyses are concerned, but lower in tonnage, due to inadequate filling and power equipment.

Table I.

AVERAGE PRACTICE AT DUQUESNE BLAST FURNACES FOR 1897, 1898 AND 1899

	—1897—		—1898—		—1899—	
	Bessemer.	Basic.	Bessemer.	Basic.	Bessemer.	Basic.
Daily product, tons	477	438	515	532	509	565
Coke per ton iron, pounds	1,940	2,016	1,939	1,842	2,059	2,001
Silicon in iron, per cent	1.11	1.00	1.17	0.53	1.24	0.59
Sulphur in iron, per cent	0.023	0.034	0.025	0.042	0.029	0.048
Ratio coke to ore	2.027	1,934	2.137	2.210	1.988	2.105
Per cent Mesabi ore used	37.48	36.88	36.05	36.57	33.13	39.83
Per cent flue dust made	4.1	5.3	5.5	4.5	4.8	4.0
Flue dust per day, tons	35	39	52	44	45	42
Flue dust per month, tons	1,069	1,398	1,576	1,282	1,362	1,288
Theoretical slag volume	1,108	1,157	*	*	*	*
Silica in slag	33.03	32.96	33.53	32.16	33.75	33.11
Alumina in slag	14.01	14.37	14.46	14.56	15.00	14.34
Cu. ft. air per minute	40,352	37,244	47,280	45,827	53,765	54,423
Cu. ft. air per ton iron	118,096	121,044	*	*	146,566	134,352
Cu. ft. air per lb. coke	60.7	60.0	*	*	74.0	67.3
Silica in ores	5.8	6.2	*	*	*	*
Heat in blast	925	950	976	1,038	943	1,025
Percentage limestone	24.5	24.3	*	*	22.4	21.5

Three furnaces working bessemer; one furnace working basic.

*Not calculated.

COMPARISON OF FURNACE PRACTICE 1897-1899, 1912-1914.

	Daily output, tons.	Coke, consumption, pounds.	Analyses. Silicon, per cent.	Sulphur, per cent.	Heat in blast. Degrees, Fahr.
Bessemer, 1897-99	502	1,979	1.17	0.026	948
Basic, 1897-99	524	1,943	0.71	0.041	1,013
Compared furnace, 1912-1914	529.3	1,925	....	.....	1,085

In the Pittsburgh and valley districts, the furnace practice was to use old range Lake Superior ores and about 35 per cent of high grade Mesabi, 72-hour Connellsville basin coke and a good grade of limestone. With the advent of higher percentages of physically fine Mesabi, economies in the manufacture of coke, and the entrance of other coal fields, the practice changed. Furnaces became more irregular, and slips, with excessive losses and high coke consumption, resulted. Many variations in ash analyses resulted from the necessary consumption of the products from a greater number of small coke plants, each with its own local method of manufacture, and therefore a new practice had to be evolved to correspond with the other conditions which had arisen.

Progress in economies and efficiencies of operation did not stop with ore and coke managements, but the germ seemed to enter the steel consumer as well. Specifications chemical and physical, became more rigid and all sorts of tests were advanced. The result was an extreme pressure on the blast furnace from two convergent sides, namely, to make better and more economical product with worse material. This was met by furnace managers straining every effort to offset the new conditions by a careful diagnosis of the difficulties to be overcome. These were lack of *regularity* and *uniformity*. Fortunately, the combustion of carbon to its monoxide or dioxide remained the same. Alumina acting either as a base or an acid still performed its same old functions. Iron oxide was still reduced by carbon monoxide (CO) or solid carbon.

To attain uniformity and regularity, new plants have been erected, or old plants remodeled. These alterations have resulted in most cases, in a mechanical equipment which is far superior to the parent plants. These equipments, although very expensive, have become necessary to insure regularity of operation.

Uniformity of material entering the furnace is of first importance. By this is meant the proper distribution on the main bell and in the furnace, and also the relation of the stock to the air distribution at the tuyeres, and the gas off-takes on top. If the material

This discussion was presented at the New York meeting of the American Iron and Steel Institute, May 28. The author, A. N. Diehl, is superintendent, Duquesne blast furnaces, Carnegie Steel Co.

is coarse it is evident that the gases will have a tendency to penetrate all parts of the mixture. If it is fine and packs along the walls, this condition will be greatly hindered, and the gases will come up through the center or some other easy point of access. If the oxygen is burned to carbon monoxide in the hearth, and channels through the stock at any point, it is evident that an irregularly working furnace will result, and that the gases will pass through at a high velocity and escape with high top temperature, naturally resulting in excessive fuel and losses.

Fine material, which checks up the interstices of the column of material, therefore is the main element which interferes with the uniform distribution of blast and gas, and causes scaffolding, channeling and the resultant evils attending these conditions. If the gas rises uniformly through the stock, over the entire area of the furnace, the velocity is decreased and the contact increased so that losses decrease in the same proportion. The distribution of stock, therefore, should be such as to present an even resistance to the uprising gas. These conditions all lead back to the essentials of our practice 15 years ago, that is, a firm clean coke of good cell structure, and a coarse and granular mixture.

Formerly by-product coke was inferior to the bee-hive oven product. Conditions have reversed and it has been demonstrated that a modern blast furnace oven can make coke of more uniform structure, ash and size, than a bee-hive oven.

Mesabi ores are being graded and mixed in ten-car lots based on silica, phosphorus and manganese content, so that the regularity from an analyses standpoint is becoming more pronounced each year. In some cases, the ore is washed, leaving a very good product for blast furnace use. Clinkering of ore should open up an enormous field and make available many fine deposits which are causing a lot of our operating troubles at present, and will cause more in the future if they are not prepared. The average sieve test of ore does not show its actual physical condition.

In Table II is shown a comparison of ore dry sieved through various mesh screens, with the same ore wet sieved. All fine particles, which cling to the larger ones, were washed through to the proper classification screen. This table gives a more accurate idea of the actual percentage of fine material in the burden, and should be used instead of dry screening for determining the physical condition of the ore.

Limestone, in some cases, is mined instead of quarried, screened and washed. It is evident that a good stone so prepared with the very fine material and clays removed, would be superior to any condition which limestone has yet received for blast furnace practice. The stone is sorted at the quarries and mixed on silica analysis. This is a proper move in the right direction and will aid enormously in bettering furnace practice.

Flue dust is concentrated and briquetted for open hearth use or clinkered for blast furnaces. The product of these methods is in better physical shape than the original ore. Some plants are using successfully from 20 to 25 per cent of this material in their charges, and doing greatly improved work, due to the opening of the burden to allow easier passage of gases and a consequent greater efficiency of reduction.

Stoves are enlarged from 150,000 square feet of heating surface to 250,000 square feet per furnace, using washed gas and small checkers to get this additional surface. Such stoves will show 1,300 degrees straight line heat. All this necessary development, with the addition of 200 to 300 degrees of heat, is required to restore former operating practice as shown by the Duquesne statistics.

If a burden is fine, the furnace will not take high heat and the intensity of blast is therefore limited. If the burden is coarse, and of open structure, it will take all the heat which can be

Table II.

WET SIEVE ANALYSIS OF ORES, 1914

	Ore No. 1.		Ore No. 2.		Ore No. 3.		Ore No. 4.		Ore No. 5.		Ore No. 6.		Ore No. 7.	
	Wgt., grams.	Per cent.	Wgt., grams.	Per cent.	Wgt., grams.	Per cent.	Wgt., grams.	Per cent.	Wgt., grams.	Per cent.	Wgt., grams.	Per cent.	Wgt., grams.	Per cent.
On 10 mesh screen	202.5	40.50	203.0	40.60	208.5	41.70	262.5	52.50	311.5	62.30	325.5	65.10	251.5	48.30
On 20 mesh screen	29.5	5.90	27.0	5.40	80.0	16.00	59.5	11.90	16.0	3.20	62.0	12.40	44.0	8.80
On 40 mesh screen	69.0	13.80	42.0	8.40	51.0	10.20	47.5	9.50	17.5	3.50	27.0	5.40	35.5	7.10
On 60 mesh screen	16.5	3.30	18.0	3.60	14.5	2.90	13.0	2.60	6.0	1.20	18.5	3.70	7.0	1.40
On 80 mesh screen	29.0	5.80	22.0	4.40	16.5	3.30	14.0	2.80	10.0	2.00	7.0	1.40	10.0	2.00
On 100 mesh screen	5.5	1.10	3.5	0.70	4.0	0.80	3.0	0.60	2.0	0.40	1.5	0.30	2.5	0.50
On 150 mesh screen	28.5	5.70	35.0	7.00	16.5	3.30	12.0	2.40	19.5	3.90	7.5	1.50	20.5	4.10
On 200 mesh screen	14.5	2.90	12.0	2.40	11.0	2.20	9.0	1.80	32.5	6.50	5.0	1.00	10.5	2.10
On 300 mesh screen	12.0	2.40	11.5	2.30	2.5	0.50	4.5	0.90	8.0	1.69	3.5	0.70	10.0	2.00
Through 300 mesh screen	93.0	18.60	126.0	25.20	95.5	19.10	75.0	15.00	77.0	15.40	42.5	8.50	118.5	23.70
Total grams	500.0	100.00	500.0	100.00	500.0	100.00	500.0	100.00	500.0	100.00	500.0	100.00	500.0	100.00

COMPARISON OF DRY AND WET ANALYSIS OF ORES

	Ore No. 1. Per cent.		Ore No. 2. Per cent.		Ore No. 3. Per cent.		Ore No. 4. Per cent.		Ore No. 5. Per cent.		Ore No. 6. Per cent.		Ore No. 7. Per cent	
	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.
On 20 mesh screen	54.59	46.40	61.13	46.00	71.08	57.70	71.70	64.40	79.13	65.50	86.91	77.50	65.83	57.10
On 40 mesh screen	10.36	13.80	10.08	8.40	6.92	10.20	7.54	9.50	3.36	3.50	4.48	5.40	10.05	7.10
On 60 mesh screen	12.44	3.30	10.58	3.60	6.29	2.90	5.66	2.30	2.66	1.20	2.51	3.70	7.79	1.40
On 80 mesh screen	1.70	5.80	1.44	4.40	1.25	3.30	1.26	2.80	0.42	2.00	0.36	1.40	1.01	2.00
On 100 mesh screen	4.67	1.10	3.33	0.70	2.51	0.80	1.89	0.60	1.12	0.40	0.90	0.30	2.51	0.50
Through 100 mesh screen	16.24	29.60	13.44	36.90	11.95	25.10	11.95	20.10	13.31	27.40	4.84	11.70	12.81	31.90
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

DRY SIEVE ANALYSIS OF ORES

	½-in. mesh. Per. cent.	⅛-in. mesh. Per cent.	20 mesh. Per cent.	40 mesh. Per cent.	60 mesh. Per cent.	80 mesh. Per cent.	100 mesh. Per cent.	Through 100 mesh. Per cent.
Ore No. 1	15.76	24.50	14.33	10.36	12.44	1.70	4.67	16.23
Ore No. 2	15.76	28.48	16.89	10.08	10.58	1.44	3.33	13.44
Ore No. 3	17.61	34.60	18.87	6.92	6.29	1.25	2.51	11.95
Ore No. 4	15.09	36.48	20.13	7.54	5.66	1.26	1.89	11.95
Ore No. 5	38.52	29.83	10.78	3.36	2.66	0.42	1.12	13.31
Ore No. 6	23.65	45.34	17.92	4.48	2.51	0.36	0.90	4.84
Ore No. 7	16.08	28.14	21.61	10.05	7.79	1.01	2.51	12.81

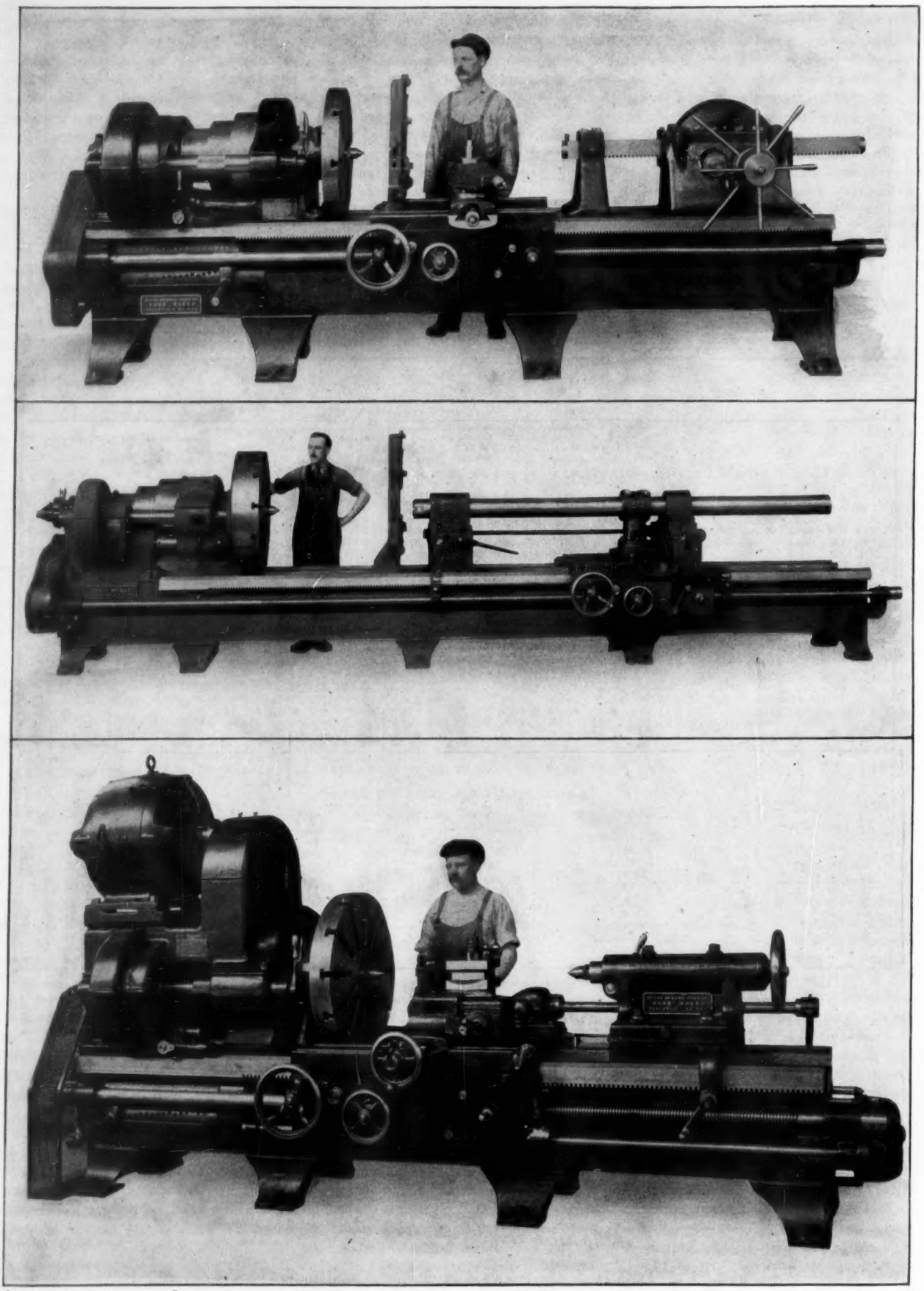


FIG. 1—ENGINE LATHE EQUIPPED WITH BORING TAILSTOCK FOR BORING HIGH EXPLOSIVE SHELLS

FIG. 2—BORING BAR MOUNTED ON CARRIAGE OF ENGINE LATHE AND ARRANGED FOR EITHER STRAIGHT OR TAPER BORING OF SHELLS

FIG. 3—ENGINE LATHE EQUIPPED FOR CUTTING WAVES AND GROOVING BAND SEATS OF SHELLS

given with resulting economies of at least 50 pounds of coke per 100 degrees of temperature applied, up to a reasonable operating point. It has been the practice in some plants to run a very acid slag, which frequently allows the use of much higher heat than a more basic slag. This, however, is considered bad practice at some plants, especially those where a rich and thoroughly reduced iron is essential, as the iron is not so "rich" if the hearth temperature is indicated by the silicon content instead of by the temperature of a more infusible or basic slag.

Should the burden be coarse and open, a more basic slag can be carried, better iron produced, and the furnace take higher blast temperatures without danger of impairing the product. German practice with regard to high heats, bears out this point. The saving in labor around a blast furnace and the development of by-products, such as gas, slag and coal-tar products, has been of extreme importance. Wonderful steps have been made in these directions, many of which are merely in their infancy. However, this is another subject altogether, and it may be said that the efforts during the past ten years have been spent from an operative practice standpoint, in adapting plants to the use of material inferior to former mixtures. Through these efforts, it has been demonstrated that the material which is being used today can be made equal to that formerly employed, and eventually will be far more economical.

This present condition is graphically illustrated by plants which have installed different equipment, working in the direction of coarse, clean, uniform mixtures, and showing remarkable results in every case. In many instances, the results are decidedly apparent, especially when compared to former practice. The Mesabi ores are with us and are going to stay. Our best known coke fields are being depleted. The limit of our operating practice is only a question of engineering, time, finance and of policy.

Special Attachments for Engine Lathes

THE ENGINE lathes shown on the facing page are equipped with special attachments which adapt the machines for the production of duplicate work in the finishing of shrapnel and all sizes of high explosive shells, both solid and hollow-forged. These attachments can be readily removed and standard parts applied, fitting the tool for regular engine lathe work. The lathes and attachments are manufactured by the Niles-Bement-Pond Co., New York.

The lathe shown in Fig. 1 is a 26-inch double back-geared engine lathe equipped with a boring tailstock for boring high explosive shells either of the solid type or of the hollow forged type. With the exception of the tailstock, this lathe is a standard type, The boring tailstock and support can be readily removed and a standard tailstock applied.

The interior contour of the shell is obtained by the use of bottoming and forming tools built to suit special requirements. The tailstock is fitted with a square forged steel boring ram. The ram has power feed through a shaft geared to the driving works and running along the rear of the bed. The shaft drives through a worm and worm wheel to the pinion and rack on the ram, giving a smooth, positive motion. Large pilot wheels are provided for hand traverse of the ram and for starting and stopping the feed. The lathe is equipped with a quick-change gear feed mechanism.

To prevent vibration of the tools, the boring ram is provided with a support which can be adjusted along the bed to a position near the work. The lathe is also equipped with a standard tool carriage for turning operations. A steady rest for supporting either a pot chuck or the shell itself, has likewise been provided. A 36-inch triple-geared engine lathe equipped with a boring bar mounted on the carriage and arranged for either straight or taper boring of shells is shown in Fig. 2. The boring bar is carried in a bearing with a swiveling base mounted in the carriage. Two supports are provided for the bar, one on either side of the carriage. These supports consist of a bearing for the bar mounted on a slide, which has cross adjustment. For taper boring, the support near the shell is shifted to one side and the other end support shifted to the other side of the central position. The central bearing of the bar is arranged to slide in and out on the carriage as the bar is fed.

The bar can be adjusted bodily across the lathe so that the cutter can be traversed inside the shell and fed into the work, at the same time remaining at a given set taper. This is accomplished by having the slides of the two end supports connected by screws and gearing so that they move simultaneously when adjusted by the ratchet wrench shown on the support nearest the headstock.

The engine lathe shown in Fig. 3 is a 30-inch double back-geared type, equipped with an attachment for cutting the waves and grooving the band seats of shells. The compound tool rest has been removed from the carriage and a special rest substituted. This consists of a lower slide which is mounted directly in the carriage and has cross adjustment by a hand screw. A tool slide is mounted on this lower slide.

To obtain the wave effect, this tool slide is given reciprocating motion parallel with the bed while the projectile revolves. This motion is obtained through an eccentric carried on a cross shaft which is journaled in the cross slide. This cross shaft is driven by bevel gears from a shaft located along the back of the lathe. This latter shaft is geared to the main spindle of the head and suitable change gears are provided for obtaining the number of waves per revolution required on different sizes and types of shells. The eccentric is adjustable to produce the desired amount of the wave. The depth of the wave rib is determined by the shape of the formed tool.

The four-sided turret tool post shown on the rear of the carriage is ordinarily furnished on this lathe. This tool post permits all the operations on the band seat to be performed at one setting.

The Sterling Wheelbarrow Co., West Allis, Wis., manufacturer of steel flasks and other foundry accessories, is enjoying such a heavy demand for its product that it will erect an extension to its flask department which will increase the floor area 7,500 square feet. Last fall an addition of this size was completed, but this has proved inadequate to the company's needs. The total business placed with the company during May exceeded all previous records. All of the orders were domestic, no foreign business having been included.

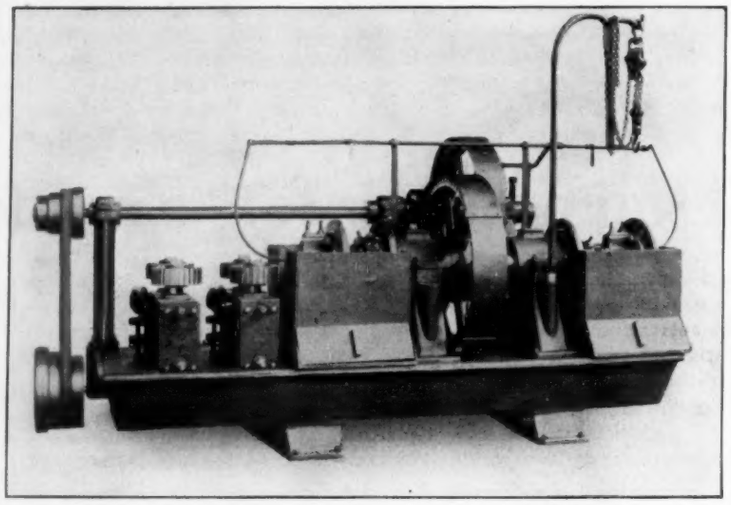
Under the heading of "Better Buildings," the American Sheet & Tin Plate Co., Pittsburgh, has issued a 64-page book devoted to the use of formed metal roofing and siding. The different uses of these materials are described and illustrated. A number of photographs and tables are presented.

Special Turning Machine

A SPECIAL machine for turning vanadium or special alloy steel from the rough bar for use in automatic machines for shell or shrapnel work, is shown in the accompanying illustration. This machine will turn all sizes of rounds from 1 to 6-inch inclusive. From 1,000 to 1,500 feet of 2-inch round material it is claimed, can be turned in 10 hours. Smaller and larger sized bars can be turned and finished in proportion.

In operation, the rough bar is fed in at one end of the turning machine by a set of feed rolls driven by worm wheels and worms. These are attached to perpendicular and horizontal shafts, having a four-step cone to regulate the feed. The material, after leaving the feed rolls, enters the roughing head which reduces it practically to size. This head, as well as the finishing head, is a steel cutter with guides set in the segmental slots which are provided with a screw adjustment. These heads are bolted to a cylinder having hollow bearings through which the material passes. The heads are driven by a gear and pinion. The gear and pinion are attached to a horizontal shaft on which are different sizes of pulleys to give various speeds to the machine. Motor drive also can be used. After leaving the roughing head, the material passes through the hollow cylinder into the finishing head which turns it to size and the bar then is ready for the automatic machines. The bed of the machine is a receptacle for a soap solution which is continually pumped on to the cutters by a small pump. The boxes surrounding the cutter heads, are used for chips and turnings. They are arranged with side openings and can be readily cleaned while the machine is in operation. At each end of the turning machine, tracks are provided with a gripping device to keep material from revolving with the machine.

This turning machine has been developed recently by the Brightman Mfg. Co., Columbus.



SPECIAL MACHINE FOR TURNING BARS FOR SHELL OR SHRAPNEL WORK

Sparks from the Grinding Wheel

By H. C. Tair

NO SCRAP for belligerents! and our neutral Uncle Sam displays his usual wisdom in this dictum. They already have all the scrap any reasonable bodies can hope for, although 27,000 tons additional would make an awful dent in the trenches. Major Boggs says that his canal scrap will be put to peaceful uses only, and the government is behind him.

* * *

From off the sea of prosperity dashes a new wave to our shores. The American people daily consume miles and miles of the unmanageable but highly farinaceous macaroni, and Italy, in her struggle for Trentino, is needful of her food supply. Machine-tool builders, hearken unto our cry. Aid us to make a million miles of farina "wire", bore us a clear conduit through the same, and start the macaroni foundries, or mills, or whatever it's concocted in. There's lots of good money in this enterprise and this kind of ammunition will be neutrally used.

* * *

Will Henry Ford attempt to revolutionize the mechanics of farming? According to report, he will make a small tractor costing $200 (less than the price of a good horse). The huge tractor benefits a few individuals only; the Ford tractor aims to place one on all our farms. Anything will be welcomed that utilizes our iron and steel —if it works out right.

* * *

It's hard lines to own property in Germany and believe that one's own country is furnishing the ammunition to shoot it full of holes. It's tough to discover a "discovery" statute in Wisconsin that only uncovers the discoverer's foolishness; to be held up to ridicule in the technical press. All this happened to Mister Pearson, who prefixes a "General" before the Samuel in his name. About all that will stop our war shipments to Europe will be a declaration of peace. A "discovery" statute isn't that kind of a fixer.

* * *

Men like Burchard of the General Electric, Swope of the Western Electric, Tucker of the Electric Construction, and Wakeman of the Society for Electrical Development, intend to supervise a nation-wide prosperity campaign to electrify prosperity. Here's hoping their first move will be to shock the calamity howler beyond resuscitation. In the words of the schoolboy on Louis XVI, have him "gelatined by the revolution".

* * *

Have you done business with the government? If not, why not? Large quantities of machinery and tools will be needed in the near future by the government for its Alaskan railroad system. Another chance to get business easy of access, where the pay is sure, where the home product has the preference, unreasonable delays are avoided and your prestige as a contractor is increased. Our government annually spends millions of dollars for machinery and tools. Are you getting your share of this business?

* * *

The *Frankfurter Zeitung* sneers that we have been told so often that "we Americans are such clever fellows" that we are beginning to believe it. Of one thing we are sure: Our good old Uncle Samuel's dollar is the cleverest piece of money in the circulating line in the world—it can remain at par. And this is more than can be said of the different moneys of our European neighbors.

Gas Blowing Engines of New Design

Description of New Blowing Equipment Recently Installed by Mesta Machine Co., at Steelton Plant of the Pennsylvania Steel Co.

MARKED advances have been made in the design of blast furnace blowing equipment during the last few years. The directions of progress stand out prominently. First, rotative speeds and piston speeds have been doubled. Second, valve gearing has been simplified. Third, automatic lubrication has decreased the cost of attendance and repairs. These three lines of progress are represented in two new gas blowing engines which the Mesta Machine Co., Pittsburgh, recently installed at the plant of the Pennsylvania Steel Co., Steelton, Pa. The gas cylinders are 46 inches in diameter; air cylinders, 84 inches in diameter; stroke, 60 inches. The speed is from 40 to 85 revolutions per minute for each engine. As shown in Fig. 1, the engines consist of two gas cylinders and one blowing cylinder in tandem. The blowing cylinder is free from valve gearing, owing to the use of the Mesta automatic plate valve (Iversen patent). This valve has been described previously in *The Iron Trade Review*.

The absence of mechanical valve gearing made it possible to place the blowing cylinder back of the gas cylinder. This arrangement differs from the previous practice, in which the blowing cylinder was placed on the opposite end of the bed plate and was connected to the main engine crosshead by rods which were arranged to clear the crank and crank pin. These rods necessitated a crank as well as openings in the bed plate. Several broken bed plates of gas blowing engines are ascribed to this use of crosshead, crank and blowing cylinder rods. In the Mesta engines, the position of the blowing and gas cylinders eliminates the rods passing from the crosshead around the crank. It also permits a rigid bed plate construction which is the same whether the engine is used for blowing purposes or for generating electric power.

The arrangement of cylinders follows European practice. In this design it originally was claimed that trouble would be experienced owing to unequal expansion of the stationary cylinders and the moving rods, and that the long train of cylinders would cause an excessive elastic stretch at the end of the blowing cylinder. Results with the Mesta engines at Steelton are said to disprove these claims. The location of the moving parts compared to the stationary parts was measured before starting and again after a shutdown following several days' operation. The difference in measurement was negligible. The total elastic stretch of the engine measured at the farthest point of the blowing cylinder is imperceptible. A 5-cent piece, it is said, can be balanced on edge in any direction on any stationary part of the engine.

In the Mesta engine, center crank construction was adopted. Its use is said to reduce the bending moment on the shaft and permit a shaft of smaller diameter to be used. This requires a smaller opening in the bed plate. The center crank eliminates the one-piece design of crank and crank pin.

The Mesta engine is of the single tandem design. This type, it is said, has the advantages of lower initial cost and of reducing to a minimum the number of moving parts which require attention. There is only one crank pin and one cross-head, and a comparatively small number of valve gear parts. Each part is larger but the increase in size offers no additional difficulties in manufacture.

In designing the gas cylinders, particular attention was given to obtaining a sound casting. The cylinders were made in halves, of fairly soft,

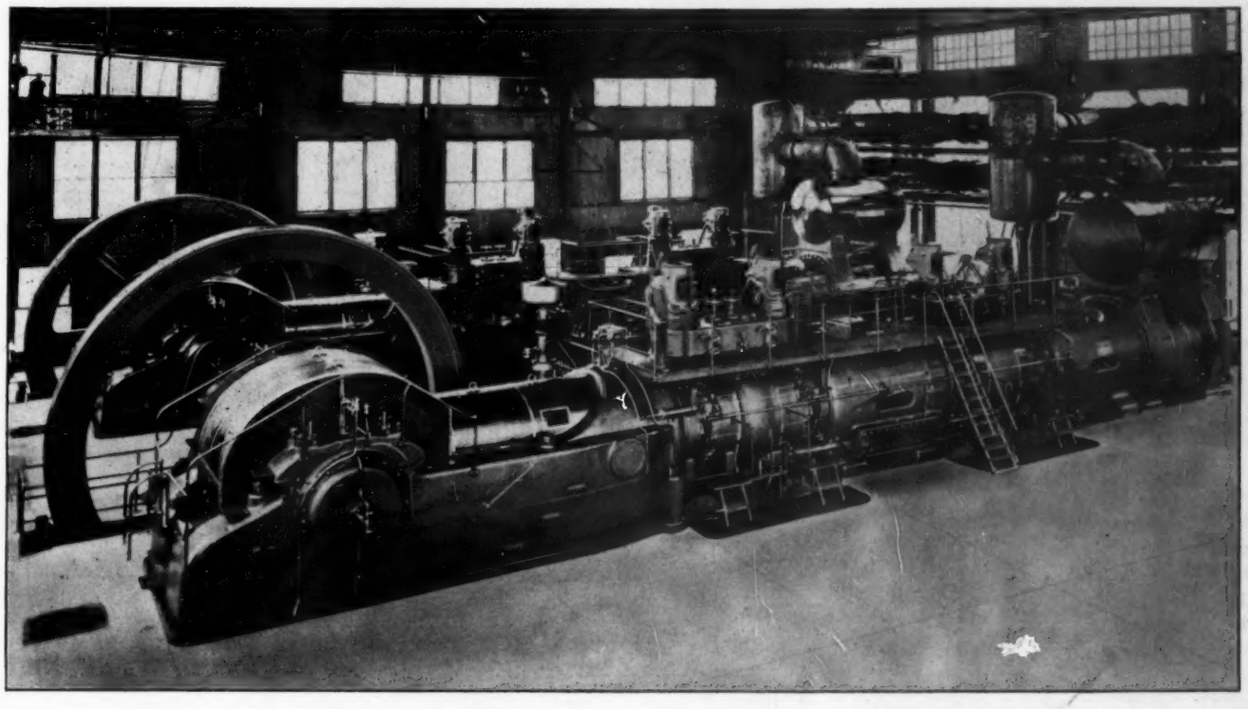


FIG. 1—GAS BLOWING ENGINES INSTALLED AT STEELTON, PA., BY MESTA MACHINE CO.

close-grained air furnace iron. These two halves were securely connected in the center. In order to obtain a good wearing surface, the cylinders were lined with a hard, close-grained iron bushing extending over the entire stroke of the piston.

Rapidity of Handling

The gas blowing engine at the Pennsylvania Steel Co.'s plant can be started and put on the furnace in less than one minute. This rapidity of handling is made possible by concentrating all the operating levers and hand wheels on one operating stand. The switchboard and control hand wheels are shown in Fig. 3 and the governor and speed-changing device in Fig. 2. When the signal is received from the furnace to slow down the engine, a switch, thrown in at the control stand, changes the tension of the spring in the governor column and thus reduces the speed. As soon as the desired speed is obtained, the switch is pulled out. The speed-changing device, which is motor-driven, is provided with limit switches so that the engineer cannot exceed the speed change limit set by the designer.

The exhaust valves are not water cooled, the valve seat being cooled and the valve itself conveying enough heat to the valve seat to protect itself. It has been claimed that a gas engine exhaust valve must withstand the action of a red hot flame passing through it. Theoretical calculations and actual measurements show that the temperature of gases passing the exhaust valves is from 1,100 to 1,150 degrees Fahr., unless combustion is sluggish during the explosion stroke and continues up to the time when the gases pass through the valve into the exhaust. With a properly designed engine and ordinary care in operation, combustion is completed before the exhaust valve opens.

Lubricating System

The oiling system for these engines consists of individual filters for each engine. The two filters are operated as one unit with one large clean oil receiver. The oil from this receiver is pumped into the system by a motor-driven triplex pump running at a very slow speed to prevent churning of the oil. This pump delivers the oil to the system at a pressure of 30 pounds per square inch. It is equipped with an automatic by-pass which allows the oil to flow back into the clean oil compartment whenever the pressure exceeds 30 pounds. To insure safety a duplex pump is placed in the system. This pump is connected to the compressed air and steam lines, and is controlled by a Foster regulator. In case of an accident to the motor-driven pump reducing the pressure below 30 pounds the duplex pump will automatically start up and maintain a constant oil pressure. The filter unit is made by the Richardson Phenix Co., Milwaukee, and can handle 800 gallons of oil per hour.

The lubrication of the crank pin is rather unique. The pin can be supplied with oil from two independent sources. Under ordinary conditions, oil is fed to the pin through the hollow shaft, and the supply coming from the gravity system is controlled by an extra large sight feed. In case of partial clogging of this regular supply, pressure from the oil pump can be turned directly into the pin through

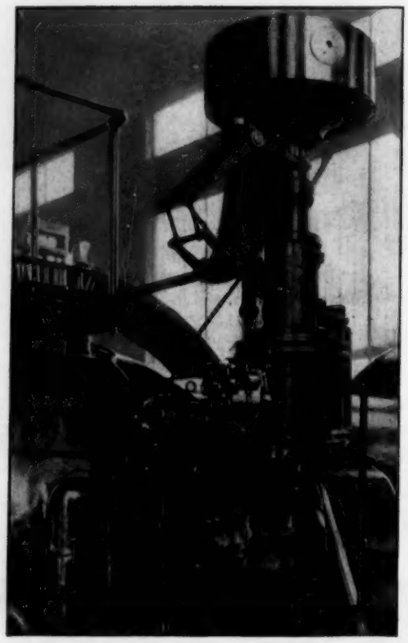


FIG. 2—GOVERNOR AND SPEED CHANGING DEVICE

a large pipe, thereby flooding, cleaning and cooling it.

Each end of each cylinder is provided with three igniters of the mechanical make and break type. A simple device is arranged on the end of the lay shaft to advance or retard all igniters. Each cylinder has a separate circuit with coils, switch, fuses and lamp. The spark coils, lamps and switches are arranged on the instrument board immediately in front of the starting stand so that the operator can convenienely check the operation of the ignition system. Any igniter can be easily removed while the engine is operating.

The regulating gear of the engine is of simple design. Each cylinder end contains plain butterfly valves, one each for gas and air. These valves are located immediately in front of the main inlet valve and are free to rotate without coming into contact with any surface that might cause friction. The vanes of these valves are very thin, avoiding the possibility of any impurities in the gas collecting on them.

Receivers Protect Blast Main

The large receivers are provided to protect the blast line from vibration. Two receivers are arranged in series close to the engine, one receiver directly on the blowing cylinder and the other a short distance away. The latter acts as a distributor for the two blast lines.

To increase the ease of handling the engine, two additional devices are provided, one for the variation of clearance space and the snorting device. Blowing engines for blast furnace service are subjected to peculiar conditions, as the blast pressure may rise 50 per cent above its normal value. If the blowing ends are properly proportioned for the average conditions, the end is too small for emergencies.

This difficulty caused the Mesta Machine Co. to design a combination of a snorting device and auxiliary clearance. In the bed plate under the blowing cylinder, are two automatic plate valves which ordinarily are kept open by hand wheel operated screws, as shown in Fig. 4. Some of the inlet valves at each end are connected to a piston, controlled by compressed air. Ordinarily these valves operate in the same manner as the other inlet valves, but if the small hand lever shown at the outer end of the horizontal diameter of the blowing head, is turned 90 degrees these inlet valves are kept open. This permits air to be moved in and out by the piston through the open inlet valves, so that no air is delivered.

Used When Changing Stoves

This device is available in starting, or in changing stoves. If the valves in the bed plate under the blowing cylinder, are closed and the inlet valves are kept open, clearance volume is added. This reduces the delivery of air and the mean effective pressure. The reduction of pressure is made use of, if the blast pressure rises beyond 22 pounds per square inch with poor blast furnace gas, or beyond 25 pounds per square inch with good blast furnace gas. Depending upon the amount of pressure rise above critical pressure, clearance volume is added either to one or both ends of the blowing piston. The volume of air delivered is maintained by speeding up the engine. The engine is designed for a maximum speed of

(*Continued on page* 62b.)

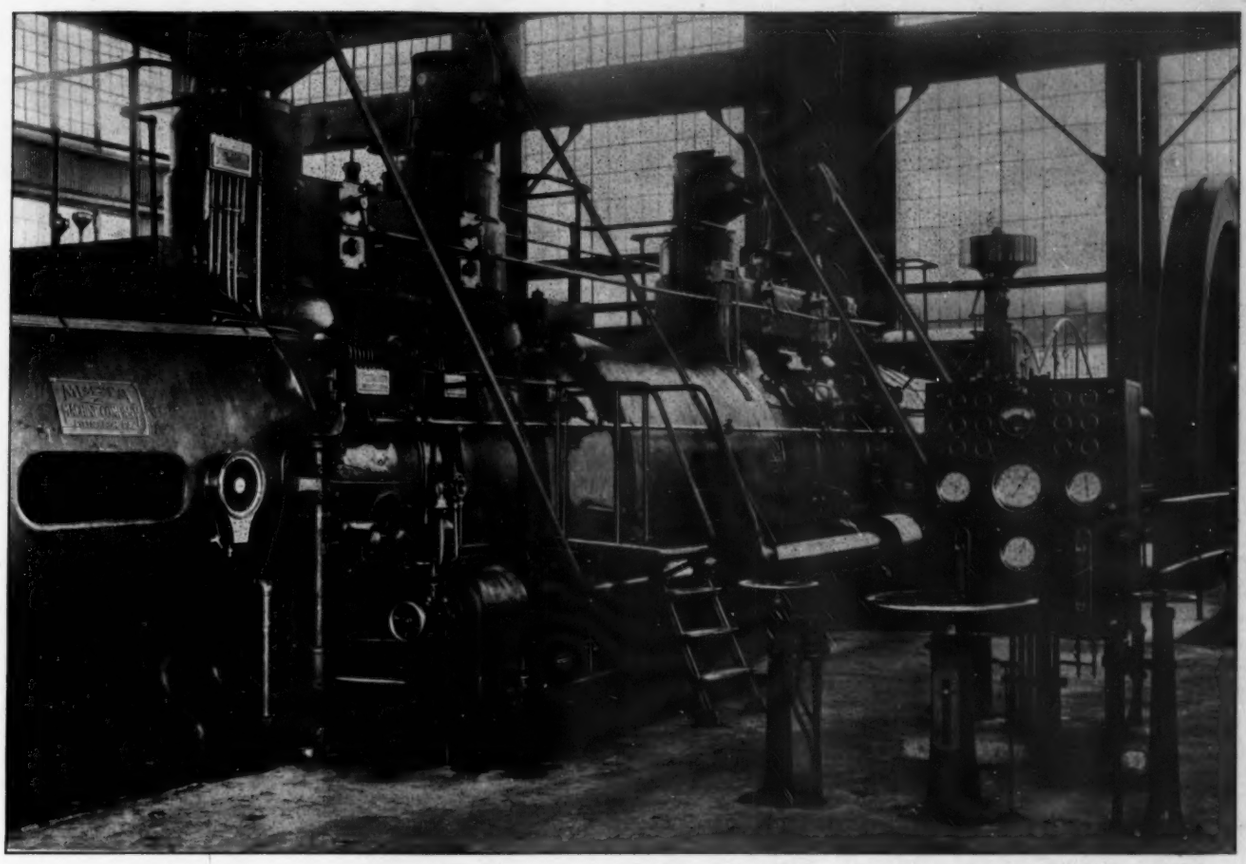


FIG. 3—SWITCHBOARD AND CONTROL HAND WHEELS

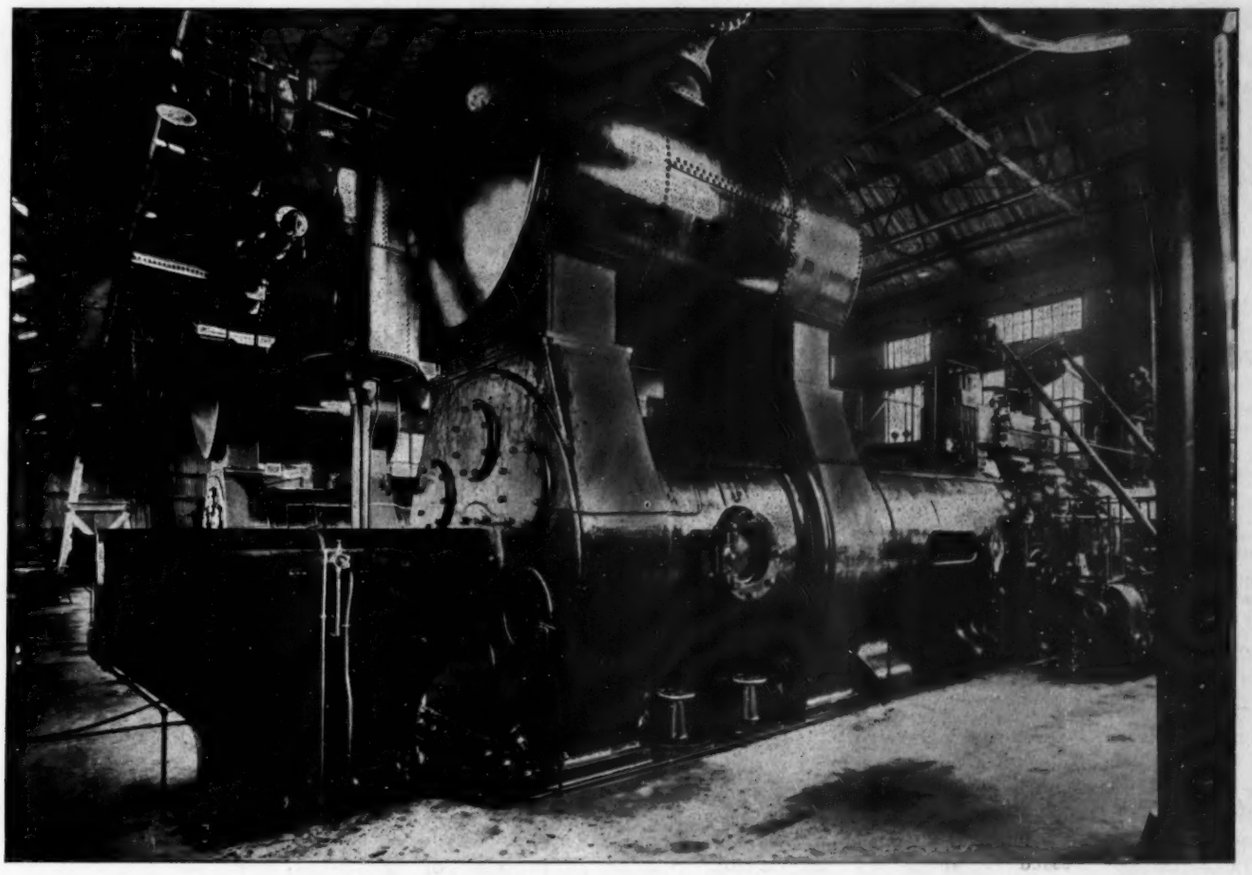


FIG. 4—ARRANGEMENT OF HAND WHEELS UNDER BLOWING CYLINDER

Knowing How

Growth of Advertising Company Demonstrates Value of Facts

The value of knowing how to give real reading value to advertising is testified in the growth of the M. K. Powers Advertising Co., which has recently incorporated under the new name of The Powers-House Co., at the same address, 724-725 Illuminating building, Cleveland. For the past three years this company, in addition to its general advertising work, has been preparing and superintending the advertising of a number of manufacturers of technical products, such as ventilators, chain hoists, pipe-threading machines and die-stocks, steam specialties, locomotive cranes, spark plugs, etc.

The backbone of its technical advertising policy has been to include, wherever possible, actual facts and figures on such details as production speed, operating costs and economies, operating methods, detailed specifications, and similar data which have actual value to plant superintendents, foremen, engineers, architects and other purchasers of machinery and allied products. The proof of the value of this policy is shown in the consistent sales gains made by its clients.

Coke Plant Started

The first coal was put into the ovens of the new by-product coke plant of the Laclede Gas Light Co. at St. Louis last week, marking the start of the plant's operations. C. L. Holman, president of the company, said that he was much pleased with results. About 200 men are now employed at the plant, and this number will be increased as activities develop. The plant is on a 200-acre tract in South St. Louis. Coal is obtained from Kentucky near the Virginia line and carried to St. Louis by rail. A barge line will be established eventually.

New Map of Pittsburgh

The Pittsburgh Industrial Development Commission, Pittsburgh, has completed an industrial map of the Greater Pittsburgh district. The map is 6 feet long and 4 feet wide and is printed in four colors. The map shows all streets, parks, roads, railroads, and street car lines, and every manufacturing plant in the district having railroad connections. It covers a territory extending from Verona on the north to Mt. Oliver on the south and from Wilmerding and McKeesport on the east to Emsworth and Nevills Island on the west. Included, is an insert map covering an area of 53 x 65 miles, from Butler and Vandergrift, Pa., on the north to Follansbee, W. Va., on the south and from Greensburg on the east to East Palestine on the west.

New Type Oil Switch

A new type of oil switch, used extensively in industrial establishments to control and protect induction motors up to 2,500 volts and 300 amperes, is shown in the accompanying illustration. It can be mounted on a wall, post or other vertical flat surface, or on the machine by means of suitable supports. The switch is manufactured by the General Electric Co., Schenectady, N. Y., in both non-automatic and automatic forms. The first is used simply to start and stop the motor, and the second to cut off current automatically from the motor, on the occurrence of an overload greater than that for which the overload trip is set.

Through a recent change in design, a low-voltage trip can be added to the automatic switch. To the non-automatic switch, either a low-voltage trip or a series-overload trip, or both, can be added whenever desired. Both means of tripping are mounted inside the switch cover.

Up to 550 volts, unless the trip coil is sufficient, an auto-transformer is used in place of the resistance previously required in series with the low voltage tripping coil. This transformer has taps to which proper connections can be made for the operating voltage. For 2,200 volt circuits, a new type voltage transformer replaces the transformer and series resistance used heretofore. The use of the new auto-transformer, or voltage transformer, is said to make the watt loss in the low-voltage device practically negligible. On the switch with the time limit-overload trip, the calibrating tubes and dash pots are protected from injury by a cast iron guard which has been added to the equipment.

Switches also can be furnished with covers arranged to mount a round pattern ammeter and provide, in addition to control and protection, a means of learning at all times the amount of current being taken by the motor. This gives a constant indication of the motor load and affords an opportunity to detect trouble in the motor or its circuit.

Members of the Engineers' Society of Western Pennsylvania inspected the plant of the Pennsylvania Rubber Co., at Jeanette, Pa., June 26.

Many Trucks

Being Exported—Algoma Rails Swell Tonnage of Imports

Supplementing the information publish in *The Iron Trade Review* of June 17 in regard to exports of iron and steel products reported on a tonnage basis, some additional facts of interest are now made public by the government.

The movement of commercial automobiles to foreign lands continues to increase, the number being 2,267 for April, 1915, valued at $5,240,481, compared with 1,339 in March, 1915, valued at $4,729,563, and 52 in April, 1914, valued at $72,676. Exports of passenger cars for April were 3,078, valued at $2,804,741, compared with 3,239, valued at $2,760,478 in April, 1914, and 2,429, valued at $1,958,302 in March, 1915. Exports of agricultural implements and parts show a sharp decline, the values being as follows: April, 1915, $1,534,715; April, 1914, $2,536,131; March, 1915, $1,567,327.

Last April there were 46 aeroplanes, valued at $318,492, exported, compared with nine in March of this year and two in April of last year. Exporting of metal working machinery, including machine tools, for April, 1915, amounted to $3,300,953, compared with only $1,308,821 a year ago, while in March of this year the value was $3,863,913. The exporting of zinc and manufactures of, except ore and dross, continues to increase, as shown by the following figures: April, 1915, $1,885,464; April, 1914, $17,029; March, 1915, $1,251,132. The exports of firearms for April, 1915, were valued at $464,913, compared with $299,223 in April, 1914. The value of all iron and steel and manufactures of exported in April, 1915, was $25,302,649, compared with $20,639,569 in April, 1914.

Iron and steel imports on a tonnage basis in April, 1915, amounted to 16,564 tons, compared with 8,025 tons in March, 1915. This increase is traceable to the heavy importing of rails, the tonnage of which in April was 8,921, compared with only 430 in March. This increase doubtless is due to the shipments from the Algoma Steel Corporation to American railroads. The total for April, 1914, was 30,584 tons.

IRON AND STEEL IMPORTS, GROSS TONS.

	April,		Ten months ending April,	
	1915.	1914.	1915.	1914.
Scrap	2,310	1,908	27,613	28,659
Pig iron	3,080	15,684	88,673	109,622
Ingots, blooms, billets of steel	1,355	6,133	22,818	31,460
Wire rods	382	731	3,853	10,202
Rails	8,921	2,098	24,612	12,520
Bar iron	270	1,147	10,786	19,349
Structural	143	2,174	5,507	9,351
Sheets and plates	59	548	2,376	2,391
Tin & terne plate	44	161	4,652	18,973
Total	16,564	30,584	190,890	242,527

Fifty-Three Standards Considered

American Society for Testing Materials Covers Immense Amount of Ground at Atlantic City Meeting—Iron and Steel Specifications a Center of Interest

THE growing demand for specifications to cover the purchase of practically all manufactured materials, was further emphasized at the eighteenth annual meeting of the American Society for Testing Materials, held at Atlantic City, June 22 to 26, with the consideration of 53 new, revised and tentative standards. Although this organization has been particularly active in the past in the formulation of iron and steel specifications, nevertheless eight new, three revised and 11 tentative standards were the result of its recent deliberations. Of particular interest are the four tentative specifications for vehicle, automobile and railway springs, as they represent the first attempt at the standardization of this product.

Finishing temperatures for rails, a subject of almost perennial discussion before this society, was again projected into the foreground by a sub-committee report which could not confirm the conclusion of a paper issued by the Bureau of Standards under the title "Observations on Finishing Temperatures and Properties of Rails." The findings of the committee were questioned by J. J. Crowe and G. K. Burgess of the Bureau of Standards, in the form of rather pointed written discussions. It is believed, however, that as a result of co-operation of the Testing Society's sub-committee and the Bureau of Standards, much informative data will be developed on a subject which is of real vital importance to the traveling public as well as to the producer and the railroads.

To those who have attended these meetings regularly for many years there is apparent a tendency away from the deliberative to the confirmative. The reason for this, however, is readily explained. Practically all of the work of the society is done by committees constituted of those directly interested and the reports represent the welding of divergent opinions. It would be manifestly impossible to consider the large number of specifications during the brief period of an annual gathering and as no standards are presented until they have received the approval of a majority of the committee members, little remains to be done other than to confirm the reports which represent the results of many hours of deliberation.

However, many valuable papers were presented at this meeting, a notable feature having been a symposium on the heat-treatment of steel.

To defray the rapidly increasing expenses of the society an increase in dues was passed to letter ballot. If this action is passed upon favorably by the membership at large, sufficient funds will be available to wipe out the existing deficit and to defray all running expenses.

AS A result of its deliberations last week, the American Society for Testing Materials adopted eight new, three revised and 11 tentative standard specifications of interest to iron and steel manufacturers. These are as follows:

New Standards: Quenched, high carbon steel splice bars; quenched, carbon steel track bolts; quenched, alloy steel track bolts; lap-welded and seamless boiler tubes for stationary service; welded steel and wrough iron pipe; methods of chemical analysis for alloy sheets; iron and steel chain and cold-drawn, open-hearth steel automatic screw stock.

Revised Standards: Structural steel for bridges; automobile carbon and alloy steels and malleable iron castings.

Tentative Standards: Methods for the sampling and analysis of pig and cast iron; government bronze—copper, 88 per cent; tin, 10 per cent, and zinc, 2 per cent; carbon steel for vehicle and automobile springs; silico-manganese steel bars for automobile and railway springs; chrome-vanadium steel bars for automobile and railway springs; helical and elliptical springs for railways; alloy steel forgings; quenched and tempered alloy steel axles, shafts and other forgings for locomotives and cars; methods for sampling coal; methods for sampling foundry coke and methods for sampling and analysis of coal.

In referring to the revision in standard specifications for structural steel for bridges, the sub-committee stated that the change made is designed merely to express more clearly and definitely the necessary requirements as to tensile strength of specimen tests of unannealed bars to meet the required minimum tensile strength of full-size annealed eye-bars. Commenting upon the tentative standards for spring steel, the committee pointed out that it is not prepared, at this time, to specify requirements as to permissible variations in the gage and width of bars for vehicle and automobile springs and will give this question further consideration. With reference to the specification for helical and elliptical springs for railways, the committee emphasized the fact that no requirements in these specifications are to be construed as defining practice in the design of springs.

Standard Pipe Threads

The question of standardization of pipe threads has been under consideration by a sub-committee, in co-operation with various associations interested in this question. Recently, by action of the executive committee, a new committee on revision of pipe threads has been formed under the chairmanship of H. V. Wille, of the Baldwin Locomotive Co., Philadelphia. This committee is to report its recommendations to the committee on standard specifications for steel before reporting to the society.

During the past year, the question of revising the standard specifications for boiler and firebox steel to agree with the boiler code which has been drafted by the American Society of Mechanical Engineers, has been considered. No report, however, will be made until next year, and in the meantime special study will be given the subject of additional tests of boiler plate to determine the uniformity of the metal throughout the plate.

In obtaining information for the standard methods of chemical analysis for alloy steels, covering nickel, chrome-nickel, vanadium, chrome-vanadium and silico-manganese steels, the committee obtained carefully-detailed outlines from 73 laboratories, comprising 35 steel companies, 12 testing laboratories, 12 railroad laboratories and 14 other consumers. In view of this widespread information, the members of the committee are of the opinion that the methods are thoroughly representative of current practice.

The committee on test ingots for ladle analysis reported that it has secured ingots from a number of steel companies. The study of these will cover the chemical survey, with special reference to the location of the drill hole from which is obtained drillings for ladle analysis, and the microscopic survey showing structural condition in longitudinal and tranverse sections.

Regarding the relation between yield point and tensile strength of steel, the committee recommended that this be

permitted to stand at 0.5, as given in the present specifications for steel and steel products. The permissible variation in weight and gage of sheared plates has been given careful consideration during the year and at the various meetings of the sub-committee, data involving many thousands of plates were presented. However, after careful deliberation the sub-committee was unable to make unanimous recommendations and the consideration of the question will be continued in co-operation with the Association of American Steel Manufacturers.

New specifications that will be considered this year include specifications for screw spikes, tie plates and ties; springs for automobiles and standard holders for 2-inch test specimens.

Rail Finishing Temperatures

In a paper written by G. K. Burgess, J. J. Crowe, H. S. Rawdon and R. S. Waltenburg, which was issued by the Bureau of Standards under the title "Observations on Finishing Temperatures and Properties of Rails," the standard specifications of the Testing Society for carbon steel rails were criticized in a general condemnation of the use of the shrinkage allowance as a basis of temperature determination and it was pointed out that the shrinkage was too great. The committee on standard specifications for steel deemed it advisable to consider these criticisms and the report of the sub-committee, to which this task was allotted, was published in the June 24 issue of *The Iron Trade Review*. In all of the information available as to actual tests the sub-committee found that there is lacking anything which points to such decided differences in the quality of rails rolled at varying temperatures, as theoretical considerations have led some of the committee members to expect. Furthermore, the differences are so slight, that it seems hardly justifiable to go to any great expense in determining finishing temperatures any more accurately than is possible with the shrinkage clause in the specifications, and since this is so easy of application, it is by far the most convenient means of checking the finishing temperature.

A written discussion of the sub-committee's report was presented by G. K. Burgess of the Bureau of Standards. He directed attention to the fact that the report contained no specific recommendations regarding the shrinkage clause in the rail specifications of the society. Also he commented pointedly, that the shrinkage clause means something or nothing, but it cannot mean both. Continuing, the discussion follows:

It also is evident that in the rail mill a suitable shrinkage allowance must be made or the cold rails will not be of the required length. There is, however, a fundamental difference in principle between what is the mill's convenience in manufacturing and a supposedly upper limit of finishing temperatures which the specifications say the mill must not exceed. The writer would like to ask the committee if it has any information of the percentage of rejections due to hot-finishing under the shrinkage clause —not rejections because of incorrect cold length as such, but on account of temperature of rolling?

Discrimination for Heavy Section

The shrinkage clause permits a maximum shrinkage of 6¼ inches in 33 feet for a 100-pound rail, but only 6⅛ inches for a 75-pound rail, corresponding to a difference in finishing temperatures of some 60 degrees Fahr.—why this discrimination in favor of the heavy section? Is the answer to be sought in the fact that the lighter section has different and less desirable properties when rolled 60 degrees Fahr. hotter than is allowed by the specifications, or was this allowable "⅛-inch for each increase of five pounds in the weight of the section" put into the specifications because, in the mill, starting with ingots (or blooms) at the same temperature, the rails of heavy section will naturally be finished hotter than the lighter for a given mill train and speed? In other words, does the ⅛-inch per five pounds represent a manufacturing convenience or simply a necessary limitation on the operation in view of the properties of the finished rail? If the former, it is not needed in the specifications; if the latter, the report of the committee does not give sufficient evidence on the desirability of having a higher upper limit for finishing heavy sections.

As to the actual maximum finishing temperatures permitted by the shrinkage clause, according to the Bureau of Standards' measurements they amount to 1,120 degrees Cent. (2,045 degrees Fahr.) for 100-pound bessemer rails, or almost exactly the usual temperature of the ingot in the blooming mill; although the committee, as evidenced by the last sentence of this report, are content with this shrinkage allowance. The question may also be asked, in view of the undoubted fact that rails finished too cold may be dangerous, why is there not a lower shrinkage limit as well as an upper?

The committee advances arguments for preferring the shrinkage method of measuring finishing temperatures to the pyrometric method described in the paper issued by the Bureau of Standards. The authors of that paper, when recommending the latter, considered all the points now raised by the committee, several of which apply with equal force to both methods. It is of course evident, whether it is a preferred method or not, that when correctly used, the shrinkage of a rail may be used as a measure of its temperature at the hot saw. The writer considers, however, that he and his associates have proved the present maximum shrinkage allowance is of no practical significance and is moreover misleading, since it permits (according to our measurements) finishing rails at a temperature some 800 degrees Fahr. above the critical temperature (1,240 degrees Fahr.) of rail steel, whereas, it is evident from the discussion attending the establishment of the shrinkage clause, that the intention was to limit finishing to slightly above this recalescence point.

The committee objects to the optical pyrometric method used in these measurements for the reason that it does not give the temperature of the rail and that the shrinkage is controlled by the flange. There were, however, temperature measurements made for this committee's report, but there does not appear to be included any statement of the pyrometer used or whether the temperature results from the several mills are really comparable. There also appear to be several inconsistencies in the report in respect to finishing temperatures and shrinkage. In the writer's opinion, this flange effect is of little or no consequence at least with the more recently developed American sections, and it is always to be borne in mind that at the recalencence point any ordinary rail section will take up a practically constant temperature throughout, this phenomenon acting, therefore, to diminish the flange effect; and furthermore, this recalescence or equalizing point being below the temperature of the rail at the hot saw, the method of measuring temperatures there bears no necessary relation to the history of the rail below the critical range.

Pyrometric Method

The writer is surprised to note the opinion of the committee on which there are several mill representatives, that if rail finishing temperatures were measured by a pyrometer this would be a costly operation and it would be difficult to locate and sort the cold rails in terms of their finishing temperatures. Is there not room on the 33 feet of the rail web to stamp the ingot number which, with the heat number and rail letter now stamped will absolutely identify every rail? The pyrometric observer—who may be a manual training graduate at $400 or $500 a year with his pyrometer kit costing $100 to $250,—will have no difficulty in following the heat numbers from his station. If, therefore, as the committee appears to believe, it is nevertheless of some importance to control finishing temperatures, this can be done accurately, cheaply and simultaneously with the rolling, by the pyrometric method described.

It does seem to the writer that the evidence offered by the committee on the relation of finishing temperatures to properties and service of rails, although undoubtedly of value, is very inconclusive. In some of the experiments the temperature range is too small, in all of them the pyrometric method is but vaguely described or only hinted at; the various sets of data relate usually to rails of different or unstated composition or method of manufacturing and of various weights and sections, thus introducing uncertain and numerous variables which will influence the physical properties measured, but above all there have been too few observations taken to reach definite conclusions.

The problem, apparently, can only be solved by comparing the properties and behavior in like service of several thousand tons of rails which are as identically similar as may be in all respects, except that one-half say should be

rolled and finished hot and the other half cold, or better there should be three grades, the temperature of each of which should be controlled exactly by modern pyrometric methods. The writer, representing the Bureau of Standards, would be pleased to have the opportunity to co-operate with the committee in a practical program of this kind which would not be difficult of execution and which might solve a problem which has perplexed those interested for the past 15 years or more.

Would Eliminate Shrinkage Clause

J. J. Crowe, of the Bureau of Standards, said that since the results of the sub-committee's deliberation show that rails having a much larger shrinkage than that permitted by the specifications of the Testing Society are as good as those finished with a shrinkage covering within the specifications, there is no good reason why the shrinkage clause cannot be eliminated, permitting the mills to finish at whatever temperature suits them best until such time as it is conclusively proven that there is a best finishing temperature or best finishing temperature interval and then measure the finishing temperature by the shrinkage, or any other convenient method which will give satisfactory results.

E. F. Kenney, of the Cambria Steel Co., Johnstown, Pa., said that no satisfactory reason has yet been given for the removal of the shrinkage clause from the rail specification as it is of value, notwithstanding the fact that it was inserted some years ago. C. D. Young, chairman of the committee on standard specifications for steel, stated that the sub-committee will gladly cooperate with Mr. Burgess and others of the Bureau of Standards in a further investigation of this important subject.

Heat-Treatment of Steel

A series of five papers on various phases of heat-treating steel constituted a symposium on this subject which engaged the time of one entire session. H. V. Wille, Baldwin Locomotive Works, Philadelphia, discussed "Interval Stresses Developed by Different Quenching Mediums and Their Effects." Tests were made in a cylinder, 9½ inches in diameter, which was quenched in water, light tempering oil, heavy tempering oil, fish oil and cottonseed oil. A slow and mild water quench resulted in a fibre stress of 45,000 pounds per square inch; light tempering oil, about 35,000 pounds; fish oil, about 30,000 pounds and tempering oil, about 24,000 pounds. The tensile properties of rapidly cooled steel were superior to those cooled at a slower rate. However, internal cracks developed in a carbon steel forging cooled at an extremely high rate, but this was accompanied by a high elastic limit, percentage of elongation and reduction of area. The experiments showed that metallurgists are confronted with the alternative of being satisfied with conservative physical properties in quenched-and-tempered material, or of accepting the danger of an occasional failure from the development of internal fracture.

K. W. Zimmerschied, chief metallurgical engineer, General Motors Co., Detroit, briefly detailed the results of a series of experiments which involved the repeated quenching of a steel cylinder. It gradually became reduced in length.

An exceedingly interesting series of experiments to determine the variations in rates of heating of steel specimens of different sizes to various furnace temperatures, and particularly to determine the relation in temperature between the atmosphere of the furnace, the surface of the specimen and various points in the interior of the specimen, was discussed by Morris E. Leeds, of the Leeds & Northrup Co., Philadelphia. The tests were made on round steel specimens of open hearth 0.5 per cent carbon steel, ranging in size from 12 inches in diameter by 24 inches long to 2 inches in diameter by 24 inches long. Each specimen was heated to four temperatures, namely, 1,000, 1,400 and 1,600 degrees Fahr. During the time of heating a continuous record was kept of the furnace temperatures, the temperature of the surface of the specimen and of one to three points in its interior. These interior points were 2, 4 and 6 inches from the surface. It was found that the specimens assumed the furnace temperature in less time as the temperature increased, except when the furnace temperature was slightly above the transformation point; that the temperatures throughout the interior of the specimens equalized themselves rapidly; that a contact thermo couple may be used to show when the specimen has reached the furnace temperature throughout its mass, and that a contact couple may be used to show when the specimen possesses increased circumference and it was believed that if the heating and quenching operation had been carried on a sufficient number of times the cylinder would have become spherical in form. In discussing the temperature of the quenching medium, Mr. Zimmerschied said that water near the boiling point does not have nearly as great a quenching effect as slightly below the boiling point.

One of the members outlined his experience in quenching material for shrapnel. He said that the use of water as the quenching medium produced such excessive shrinkage, that oil had to be used exclusively. Also, it was pointed out that the actual volume of steel becomes greater with quenching, although certain dimensions may become smaller.

Brinell and Scleroscope Hardness

Robert A. Abbott, metallurgical engineer, Peerless Motor Car Co., Cleveland, presented a paper on "The Relation Between Maximum Strength, Brinell Hardness and Scleroscope Hardness in Treated and Untreated Alloy and Plain Steels," which is summarized briefly as follows:

The object of the investigation was to determine the relation existing between (1) the hardness numbers of steel as determined by the Brinell and scleroscope methods; (2) the maximum strength of steel and the Brinell hardness number; (3) the maximum strength of steel and the scleroscope hardness number.

The investigation was carried out upon 300 types of steel, each of which was heat-treated in various ways. The results obtained on carbon, nickel, chrome-vanadium, high-chrome-nickel, and low-chrome-nickel steels only were considered and they comprise 3,932 tests.

Eighteen equations have been determined connecting the three quantities, maximum strength, Brinell and scleroscope hardness for the five different types of steel and also for all of the steels considered together.

Comparisons were made between annealed and heat-treated steels, and also between low and high-carbon steels, heat-treated to show the same maximum strength.

Careful Heating

In the discussion of these experiments it was pointed out that there is little difference between the inside and outside temperature of a steel object while it is being heated. It was stated also, that specifications for heat-treated forgings invariably specify slow and careful heating accompanied by high tensile strength requiring rapid cooling and thereby eliminating the desirable effects expected to result from slow heating. Mr. Wille stated that he contemplates making a series of tests, which will be the reverse of those made by Mr. Leeds, consisting of experiments on the rate of cooling. It was claimed that when a forging is cooled quickly, the difference between the surface and interior temperatures frequently is from 500 to 1,000 degrees Fahr.

Discussing the heat-treatment of large forgings, Mr. Abbott said that the work invariably will be successful if they are heated slowly, but if heated quickly, flaws are almost certain to develop. This is due to the fact that when heated rapidly, the outside of the section has a tendency to pull away from the inside. On the other hand, rapid cooling has the reverse effect and the compressive strains of cooling have a tendency to compensate for the defects caused by too rapid heating.

Other papers presented at this session included "Micrographic Determination of Surface Decarburization in Heat-Treated Steels," by J. G. Ayers Jr., which was published in these columns, June 24, and "The Charpy Impact Test on Heat-Treated Steel," by J. J. Thomas.

Chain Specifications

Probably the most important work of the committee on wrought iron involved

the preparation of standard specifications for iron and steel chain. These were adopted without change and referred to letter ballot. The sub-committee which had these specifications in charge was increased during the year to include representatives of several of the leading chain manufacturers, shipbuilding interests and Lloyds Register of Shipping. The specifications for iron and steel chain differ slightly from those of the Master Car Builders' Association, but members of that organization, who also are members of the sub-committee of the Testing Society are of the opinion that the Master Car Builders will revise their specifications to conform to those prepared by the testing society's sub-committee.

The sub-committee on tubes and pipes held several meetings with the sub-committee on steel tubing and pipe for the purpose of formulating the specifications for lap-welded and seamless boiler tubes for stationary service and welded steel and wrought iron pipe. As a result of these deliberations specifications for boiler tubes and for pipe were submitted and referred to letter ballot. Recently the question as to when a vibratory requirement would be reinserted in the standard specifications for staybolt iron has been raised several times and as a result of this interest and further information relative to this requirement now available, the sub-committee will give this subject special attention during the ensuing year with a view to revising the present specifications to include such a requirement.

Open Hearth Screw Stock Specifications

Two years ago standard specifications for bessemer automatic screw stock and open hearth automatic screw stock were submitted by the committee on standard specifications for cold drawn steel and last year the standard for bessemer screw stock was adopted, but the open hearth specifications were held as tentative. The committee therefore suggested that the specifications for open hearth automatic screw stock be recommended for adoption and these were referred to letter ballot.

Malleable Iron Revision

Standards for the foundry product, and materials entering into the production of castings, were presented in the form of revised specifications for malleable iron, methods for the sampling and analysis of pig and cast iron for export, specifications for coke, and government bronze, consisting of copper, 88 per cent; tin, 10 per cent and zinc, 2 per cent. The sub-committee which revised the specifications for malleable castings worked jointly during the year with a similar committee from the American Foundrymen's Association and also had the co-operation of representatives of the Master Car Builders' Association. In submitting these revised specifications the committee directed attention to the fact that the time is not far distant when specific standards for malleable castings intended for definite classes of work will have to be prepared. It was pointed out that malleable iron car castings for example, must be soft enough to permit riveting, whereas conveyor chain links must be strong, yet inelastic. While these are diametrically opposite requirements, such castings are usually made from the same heats in many establishments attempting to turn out work to specifications. The revised malleable standard was adopted without change and was referred to letter ballot.

Reference was made to the progress reported in the formation of a sub-committee of standard specifications for soil pipe and fittings. Several conferences have been held with those most interested, but sufficient progress has not been made to submit a definite report. The revision of the present standard specifications for car wheels has been referred to the proper sub-committee for early attention.

Sampling Pig and Cast Iron

The report on standard methods of sampling and analysis of pig and cast iron for export was prepared by W. F. Hillebrand, of the U. S. Bureau of Standards, who is the American member of the committee of the International Association for Testing Materials having this work in charge. This report was submitted by Mr. Hillebrand to leading chemists and metallurgists who enthusiastically approved it as representing the best practice of this country. However, if the European members of this committee can improve these proposals, the American committee gladly will co-operate with a view of making American practice conform in every way to the most advanced thought of the world.

Other than for graphite and total carbon, and check analyses of determination for the other elements, the refinement of the practice for obtaining the portions for analysis were questioned. In discussing this feature of the proposed specifications, Albert Ladd Colby suggested that greater care should be exercised in sampling, than provided for in the recommended standard, and that the sieving of the drillings be eliminated. He believed that better results will be obtained if more pigs are drilled, than the one specified for every four tons. An amendment to the sampling section of the proposed standard then was offered by Mr. Colby which provides that the portioning of the drilling method should be pursued only for graphite and total carbon analyses and for the check analyses in the determination of other elements. By the insertion of this clause, it is believed that the sampling method will receive wider application, than as originally prepared.

R. H. Sweetser, president of the Thomas Iron Co., Easton, Pa., pointed out that the tendency is toward a lower graphitic and total carbon content in pig iron and unless great care is exercised in sampling, the analysis will show a lower carbon content than actually is the case. Standard methods were tentatively adopted for the sampling and analysis of pig and cast iron intended for both domestic and export use and if adopted next year they will govern all practice instead of only for export materials as originally provided.

Sulphur in Steel Castings

For several years manufacturers of steel castings have urged the adoption of an allowance of 10 per cent excess for sulphur on the check analysis of castings for railway rolling stock, as provided by the standard specifications for steel castings. This requirement now is 0.05 per cent sulphur and the excess of 10 per cent desired would increase this to 0.055 per cent. This suggestion was referred to the railway members of the committee on standard specifications for steel, but as the vote was overwhelmingly against the change, no excess allowance on sulphur will be permitted.

Foundry Coke Specifications

In view of the difficulty of formulating definite standard specifications for beehive and by-product coke covering a sufficiently wide scope, the committee decided to direct its work along four lines, including methods of sampling coke, standard methods of chemical analysis, standard methods of the physical testing of coke and standard specifications for foundry coke. As a result of these deliberations only tentative specifications for foundry coke were presented, owing to the wide variation in the physical and chemical requirements of coke used for various purposes. It was recognized that a rational and accurate method of sampling coke should involve taking regular increments while loading or unloading the car to secure a several hundred-pound gross sample, which should then be reduced by suitable methods of crushing, mixing and quartering to a convenient size for transportation to the laboratory. This method of sampling, however, presents several difficulties including the crushing and reduction of several hundred pounds of coke necessitating the use of mechanical crushers, seldom available at the point of sampling. Furthermore, sampling while unloading the coke is feasible only when the coke is produced under a system of premi-

ums and penalties, which the trade is not willing to accept at this time.

The report further stated, that since the only acceptable form of specification is one based on maximum and minimum limits of chemical composition with the privilege of rejection when these limits are exceeded, it seemed essential to take the sample from the exposed surface of the car so that the car could be rejected before unloading, in case the coke did not conform to the specifications.

The committee recognized that a minimum gross sample of two pecks of walnut size is too small to be strictly representative; however, in view of the fact that a sample taken from the top of a car is only approximately representative of all the coke, it seemed unnecessary to impose the extra expense entailed by crushing down a larger sample.

Satisfactory progress has been made toward the adoption of uniform standard methods of analyzing coke, by cooperation with the joint committee on coal analysis of the American Chemical Society and the American Society for Testing Materials, and the committee on coke analysis of the American Foundrymen's Association. It is expected that uniform standard methods will be available for incorporation in coke specifications by the end of another year.

The committee gave considerable attention to the various physical tests of coke, such as crushing strength, shatter test, porosity, specific gravity, etc., and as a result of this investigation concluded that the compressive strength test, as determined on 1-inch cubes is worthless as a means of comparing different cokes, and that in general, the relation between results of physical tests of coke and its value in practical use is too indefinite to include quantitative expressions of physical properties in standard specifications at present.

Sampling Coal

A proposed tentative method for the sampling of coal was submitted by the committee on standard coal specifications. In presenting its report the committee stated that inasmuch as the purchase of coal under specifications is in a state of evolution and development, and as experience and time are required to develop standards, the time has not yet arrived for the preparation of standard specifications. Accordingly, a tentative method for the sampling of coal was prepared which it is believed represents real and substantial progress toward the preparation of standard specifications for the purchase of coal.

Preservative Coatings for Structural Materials

The committee on preservative coatings for structural materials reported that the sub-committees on inspection of the Havre de Grace bridge and of the steel plates at Atlantic City have been discharged as both tests have been completed and final reports have been made. The history of the Havre de Grace bridge test was outlined in the report, including the composition of the paints used, the panels painted, rates of spreading, etc. As a result of the report of the sub-committee on inspection of steel plates at Atlantic City, a new sub-committee on accelerated tests and the influence of paint materials on corrosion will be appointed.

The tests at Atlantic City were undertaken a number of years ago following the presentation of a paper on the "Corrosion of Iron" by E. A. Cushman, in which the suggestion was made that the various types of substances used as pigments in protective coatings might exert a stimulative or inhibitive action on the rate of or tendency to corrosion of the underlying metal. In view of the well-known fact that alkalies inhibit while acids stimulate the corrosion of iron, it was suggested that action of more or less pure pigments of iron in the presence of water should be thoroughly investigated. The water pigment tests consisted in immersing samples of steel in water suspensions of the various pigments and blowing air through the containers for definite periods of time, the corrosion being measured by the loss in weight sustained by the test pieces. About 50 pigments which are in more or less common use for painting steel were purchased in the open market and distributed among a number of the members of the committee. When the results were compared and analyzed it was decided to make a further investigation and to carry on more systematic work. The interest of the Paint Manufacturers' Association of the United States was enlisted and a series of steel panels was erected at Atlantic City in the autumn of 1908 and was placed under the supervision of the American Society for Testing Materials. From year to year since that time these panels were inspected and reported upon. In the summer of 1913, some of the panels were transferred to a frame on Young's Steel Pier.

The result of the final examination of these panels indicates that the water test, as at present developed, cannot be depended upon to give accurate information as to the protection which pigments will or will not afford metal structures. Also the summarized results indicate that arbitrary designations such as inhibitive indeterminate and stimulative as referring to results of the water tests, not always are applicable to the same pigments when used with linseed oil for protective coatings. The actual exposure tests of the oil paints, on the other hand, have afforded considerable information regarding the protective value of pigments many of which heretofore have not been used in paints for the protection of metal surfaces. The committee recommended that a further study be made of paint materials for metal surfaces as it is believed that there are factors in the water test, which if properly developed, are capable of giving useful information. It was suggested, therefore, that this test for pigments, with some possible modifications, be further investigated.

In the discussion of the paper by J. A. Aupperle, entitled "Determination of Spelter Coating on Sheets and Wire," published in *The Iron Trade Review*, June 24, it was stated that satisfactory results have been obtained by the method described in measuring the thickness of sherardized coatings.

Defective Battery Zincs

Robert Job and F. F. White were joint authors of a paper entitled "Battery Zincs, Some Causes of Defective Service." It detailed the results of an investigation of battery zincs which were of an apparaently satisfactory composition, but which gave decidedly different results in service. This was attributed to the segregated condition of the metal caused by the method of manufacture. It was pointed out that the foundry practice necessary to produce a well mixed, sound and serviceable battery zinc is not difficult, but it is particularly essential that the over-heating of the metal be avoided, either in the melting pot, or in the mold which should be cool, and that after the addition of the mercury the bath should be kept carefully stirred to avoid segregation.

Methods of Testing

Standard methods of testing were given careful consideration by committee E-1 which held four meetings during the past year, and as a result of its deliberations it prepared a recommendation for the adoption of the Brinell hardness test for metals in addition to the present standard methods for tension tests, giving the proper dimensions of tension test specimens for metal ¼-inch or under in thickness. Recommended changes in the present standard methods for tension tests regarding the manner of using extensometers when determining the modulus of elasticity, the proportional limit or the elastic limit and changes in the present standard methods for tension and compression tests, defining correctly the proportional limit, elastic limit and yield point precipitated an animated discussion which resulted in referring back to the committee these recommendations for further consideration. It was suggested that the refinements of practice outlined might be satisfactory for laboratory testing but could never be applied commercially. An

effort also was made to change the title of the committee from Standard Methods of Testing to Standard Methods of Technical Testing. This motion, however did not prevail, although it was believed that many of the practices outlined are without value for commercial testing. Three sections of the committee's report were referred to letter ballot, although two sections will have to be presented again next year.

Cylinder Friction Testing Apparatus

"Cylinder Friction and Lubrication Testing Apparatus" was the subject of a paper by Alan E. Flowers, which described a device capable of testing cylinder lubricants at various rates of feed under piston ring pressure from two to nine pounds per square inch and at steam temperatures up to 800 degrees Fahr. The apparatus has been installed at the Ohio State University, Columbus, where it is available for tests to determine the characteristics of cylinder friction and for the comparison of different lubricants under the various conditions of steam temperature, steam pressure, piston ring pressure, speed, and oil feed that obtain in service. The cylinder of this device has an 8-inch bore and an 8-inch stroke and is operated at speeds up to 300 revolutions per minute.

This apparatus measures the friction co-efficient between the piston or piston rings and the cylinder wall surface. It has been found that different lubricants do not necessarily give the same friction co-efficient and their lubricating value can be determined by means of this apparatus. Constancy of friction requires a liberal supply of lubricant, particularly as there is a difference of steam pressure on the two sides of the piston. Cutting-off or reducing the supply of lubricant brings about an increase of friction within five minutes. On the other hand, increasing the supply of lubricant may bring about a reduction of friction within 15 minutes, but at low pressures or when starting a run with surfaces free from oil it may take two hours to reach a consistently low value of friction. An increase in the rate of feed of the lubricant makes a considerable reduction in the friction when the amount fed is small, but with a continued increase of feed of lubricant the friction has a tendency to approach a certain minimum value. The friction co-efficient obtained and the amount of lubricant necessary are greatly modified by the presence of steam and by the difference of steam pressures on the two sides of the piston.

Failures Caused by Repeated Stresses

"The Failure of Materials under Repeated Stresses" was the subject of a paper prepared by H. F. Moore and F. B. Seely. Attention was directed to the fact that all ideas of the action of materials under stresses are derived from considerations of static action. However, the action of materials under repeated stresses differs from static action in important respects. Under stresses slightly lower than the elastic limit as ordinarily determined, materials fail under oft-repeated stresses, and the relation of stresses at failure to number of repetitions may be expressed by an exponential formula. A proposed explanation of this formula was given, based on the structural damage done to material by inelastic action during application and removal of load. For still lower stresses no positive evidence of a fixed endurance limit has been found for commercial materials and various methods used for locating such a supposed limit, giving varying results from the same test data, were presented.

In conclusion, examples of repetitions of stresses which may be expected to be applied to various machine and structural members, were given. It was pointed out that the members of a railway bridge carrying 100 trains per day for a period of 50 years would sustain about 1,826,000 repetitions of stresses. This would vary from the dead load to a live load stress averaging somewhat below that caused by the passage of the heaviest locomotives. A railroad rail over which 250,000,000 tons of traffic passes would sustain something like 500,000 repetitions of locomotive wheel loads. In addition, the rail would have to stand approximately 15,000,000 repetitions of stresses caused by car wheel loads. A mine hoisting rope bent over three sheave wheels and operating a hoist 100 times a day in a term of service of five years would sustain 550,000 repetitions of stresses. The piston rod and connecting rod of a steam engine running at 300 revolutions per minute for ten hours per day, 300 days per year for 10 years sustains 540,000,000 repetitions of stresses. A band saw in hard service for two months sustains about 10,000,000 repetitions of stresses. A line shaft running at 250 revolutions per minute for 10 hours a day, 300 days per year sustains during a service of 20 years, 900,000,000 repetitions of bending stresses due to force transmitted by belts, gears and driving chaings. The shaft of a steam turbine running at 3,000 revolutions per minute for 24 hours, per day, 365 days in the year, during 10 years' service would sustain 15,768,000,000 reversals of bending stresses caused by the weight of rotating parts and the tangential force of the inrushing steam.

Elastic Limit

An exceedingly interesting paper discussing the term "Elastic Limit," was presented by T. D. Lynch. He said that the term has been used with so many interpretations that serious confusion has resulted.

The following ten distinct terms he stated are in common use: (1) proportional limit; (2) elastic limit; (3) permanent set; (4) true elastic limit; (5) apparent elastic limit; (6) commercial elastic limit; (7) elastic limit by extensometer; (8) elastic limit by drop of beam; (9) elastic limit by the dividers; (10) yield point. Mr. Lynch suggested that the society work out and establish one or more practical methods for making extensometer tests in commercial laboratories, so that the members of the society, and those who look to it for such information, can make comparative tests in any laboratory.

These would ultimately result in simplifying, standardizing, and making definite the results of tests, regardless of where and by whom made.

Technical Committee Regulations

Important changes in the regulations governing technical committees were made. The definition of a nominally unattached expert was amplified. The clause governing such a committee member provides his classification as a producer if he is permanently retained by producing interests in the field of activities of the committee with which he is connected. The addition to this clause qualifies permanently retained which is understood to mean that the expert receives a regular monthly or quarterly retainer from one or more producing interests under an indefinitely continuing arrangement. Another modification of the regulations provides, that as a general policy, only one representative from a given firm, company, corporation, laboratory or other institution, shall be eligible to membership on a given committee, although exceptions to this rule may be permitted at the discretion of the committee concerned. The terms *standard specifications, standard tests* and *standard methods* were more clearly defined to enable their proper application by the various technical committees.

Dues Increased

One of the serious problems with which the society has had to contend for several years has been a constantly growing deficit arising from the tremendous increase in the cost of the publications and other expenses arising from the ever-increasing activities of the organization. Numerous methods were recommended for wiping out this deficit, but after careful consideration, the executive committee reported that an increase in dues from $10 to $15 per year for members and from 5 to $7.50 for juniors seemed to be the most feasible way of

providing funds to defray the cost of conducting its affairs. Also the cost of life memberships are to be increased from $200 to $300. The resolution was carried unanimously and was referred to letter ballot. If it is favorably acted upon by the membership at large, the increase in dues will become effective on the members Jan. 1, 1916.

Alloy Steel Track Bolt Specifications

1.—(*a*) The steel for the bolts shall be made by the open hearth or electric process.

(*b*) The steel for the nuts shall be made by the bessemer or open hearth process.

2.—The bolts shall enter the quenching medium at a temperature of not less than 790 degrees Cent. The threads may be rolled either hot or cold.

3.—The steel for the bolts shall conform to the following requirement as to chemical composition:

Phosphorus .....not over 0.035 per cent

4.—An analysis to determine the percentages of carbon, manganese, phosphorus and sulphur and any other elements used to obtain physical properties specified in Sections 6 and 7, shall be made by the manufacturer from a test ingot taken during the pouring of each melt, a copy of which shall be given to the purchaser or his representative. This analysis shall conform to the requirement specified in Section 3. Drillings for analysis shall be taken not less than ⅛ inch beneath the surface of the test ingot.

5.—Analyses may be made by the purchaser from finished bolts representing each melt, in which case an excess of 25 per cent above the requirement as to phosphorus specified in Section 3 shall be allowed.

6.—(*a*) The bolts shall conform to the following minimum requirements as to tensile properties:

Tensile strength, lb. per sq. in....	110,000
Yield point, per sq. in.....	85,000
Elongation in 2 in., per cent.....	12

(*b*) Nuts shall be capable of developing the full strength of the finished bolt up to its yield point.

7.—Full-size bolts shall bend cold through 90 degrees around a pin the diameter of which is equal to the diameter of the bolt, without cracking on the outside of the bent portion.

8.—Tension test specimens shall be taken from the finished bolts and shall be of the form and dimensions shown in Fig. 1.

9.—(*a*) One tension and one bend test shall be made from each lot of 50 kegs or fraction thereof.

(*b*) If any test specimen shows defective machining or develops flaws, it may be discarded and another specimen substituted.

(*c*) If the percentage of elongation of any tension test specimen is less than that specified in Section 6 (*a*) and any part of the fracture is more than ¾ inch from the center of the gage length, as indicated by scribe scratches marked on the specimen before testing, or if the bend test specimen breaks in the threaded portion, a retest shall be allowed.

10.—If the results of the physical tests of any test lot do not conform to the requirements specified, two additional tension and two additional bend tests shall be made from such lot, all of which shall conform to the requirements specified.

11. The bolts and nuts shall conform to the dimensions specified by the purchaser. The bolts shall be neatly formed, free from fins or nickings. The head shall be concentric with, and firmly joined to, the body of the bolt, with the under side of the head at right angles to the body of the bolt. The threads shall be sharp and true to gage and of the pattern specified by the purchaser. The nuts shall fit the bolts tightly so as to require a wrench not more than 10 inches in length to turn them down without distorting the threads or twisting the bolts. The nuts shall be screwed on before shipping, a sufficient number of turns to hold them on to destination. A variation of 1/32 inch under and 1/64 inch over the specified diameter of the body of the bolt will be permitted. The diameter of the rolled thread shall not exceed the diameter of the body of the bolt more than 1/16 inch for ⅞-inch bolts and 3/32 inch for 1-inch bolts. A variation in the dimensions of the elliptical shoulders under the head of the bolt of 1/32 inch from the specified size will be permitted. A taper of the shoulder of 1/32 inch will be permitted.

12.—The finished bolts and nuts shall be free from injurious defects and shall have a workmanlike finish.

13.—A letter or brand indicating the manufacturer shall be pressed on the head of the bolt when it is formed.

14.— The inspector representing the purchaser shall have free entry, at all times while work on the contract of the purchaser is being performed, to all parts of the manufacturer's works which concern the manufacture of bolts and nuts ordered. The manufacturer shall afford the inspector, free of cost, all reasonable facilities to satisfy him that the bolts and nuts are being furnished in accordance with these specifications. All tests (except check analyses) and inspection shall be made at the place of manufacture prior to shipment, unless otherwise specified, and shall be so conducted as to not interfere unnecessarily with the operation of the works.

15.—(*a*) Unless otherwise specified, any rejection based on tests made in accordance with Section 5 shall be reported within five working days from the receipt of samples.

(*b*) Bolts and nuts which show injurious defects subsequent to their acceptance at the manufacturer's works will be rejected, and the manufacturer shall be notified.

16.—Samples tested in accordance with Section 5, which represent rejected bolts and nuts, shall be preserved for two weeks from the date of the test report. In case of dissatisfaction with the results of the tests, the manufacturer may make claim for a rehearing within that time.

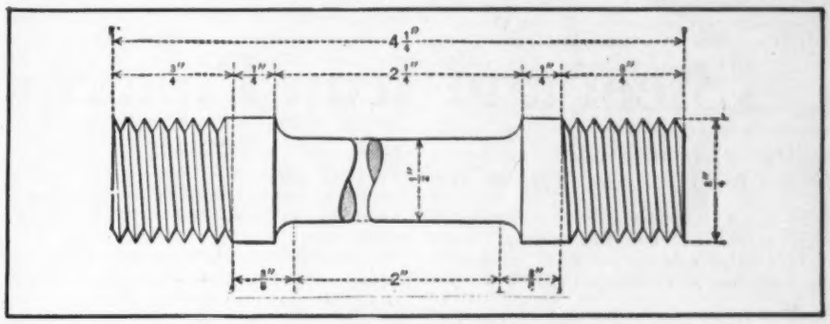


FIG. 1—DETAILS OF TENSION TEST SPECIMEN

Adopted at the Atlantic City meeting of the American Society for Testing Materials and passed to the membership for letter ballot.

Carbon Steel Track Bolt Specifications

1.—(*a*) The steel for the bolts shall be made by the open hearth process.

(*b*) The steel for the nuts shall be made by the bessemer or open hearth process.

2.—The bolts shall enter the quenching medium at a temperature not less than 790 degrees Cent. The threads may be rolled either hot or cold.

3.—The steel for the bolts shall conform to the following requirements as to chemical composition:

Carbon .....not under	0.30 per cent
Phosphorus .....not over	0.04 per cent

4.—An analysis to determine the percentages of carbon, manganese, phosphorus and sulphur shall be made by the manufacturer from a test ingot taken during the pouring of each melt, a copy of which shall be given to the purchaser or his representative. This analysis shall conform to the requirements specified in Section 3. Drillings for analysis shall be taken not less than ⅛ inch beneath the surface of the test ingot.

5.—Analyses may be made by the purchaser from finished bolts representing each melt, in which case an excess of 25 per cent above the requirement as to phosphorus specified in Section 3 shall be allowed.

6.—(*a*) The bolts shall conform to the following minimum requirements as to tensile properties:

Tensile strength, lb. per sq. in....	100,000
Yield point, per sq. in.....	70,000
Elongation in 2 in., per cent.....	12

Adopted at the Atlantic City meeting of the American Society for Testing Materials and passed to the membership for letter ballot.

(*b*) Nuts shall be capable of developing the strength of the finished bolt up to its yield point.

7.—Full-size bolts shall bend cold through 45 degrees around a pin the diameter of which is equal to the diameter of the bolt, without cracking on the outside of the bent portion.

8.—Tension test specimens shall be taken from the finished bolts and shall be of the form and dimensions shown in Fig. 1.

9.—(*a*) One tension and one bend test shall be made from each lot of 50 kegs or fraction thereof.

(*b*) If any test specimen shows defective machining or develops flaws, it may be discarded and another specimen substituted.

(*c*) If the percentage of elongation of any tension test specimen is less than that specified in Section 6 (*a*). and any part of the fracture is more than ¾ inch from the center of the gage length, as indicated by scribe scratches marked on the specimen before testing, or if the bend test specimen breaks in the threaded portion, a retest shall be allowed.

10.—If the results of the physical tests of any test lot do not conform to the requirements specified, two additional tension and two additional bend tests shall be made from such lot, all of which shall conform to the requirements specified.

11.—The bolts and nuts shall conform to the dimensions specified by the purchaser. The bolts shall be neatly formed, free from fins or nickings. The head shall be concentric with and firmly joined to the body of the bolt, with the under side of the head at right angles to the body of the bolt. The threads shall be sharp and true to gage and of the pattern specified by the purchaser. The nuts shall fit the bolts tightly so as to require a wrench not more than 10 inches in length to turn them down without distorting the threads or twisting the bolts. The nuts shall be screwed on before shipping, a sufficient number of turns to hold them on to destination. A variation of 1/32 inch under and 1/64 inch over the specified diameter of the body of the bolt will be permitted. The diameter of the rolled thread shall not exceed the diameter of the body of the bolt more than 1/16 inch for ⅞-inch bolts and 3/32 inch for 1-inch bolts. A variation in the dimensions of the elliptical shoulders under the head of the bolt of 1/32 inch from the specified size will be permitted. A taper of the shoulder of 1/32 inch will be permitted.

12.—The finished bolts and nuts shall be free from injurious defects and shall have a workmanlike finish.

13.—A letter or brand indicating the manufacturer shall be pressed on the head of the bolt when it is formed.

14.—The inspector representing the purchaser shall have free entry, at all times while work on the contract of the purchaser is being performed, to all parts of the manufacturer's works, which concern the manufacture of the bolts and nuts ordered. The manufacturer shall afford the inspector, free of cost, all reasonable facilities to satisfy him that the bolts and nuts are being furnished in accordance with these specifications. All tests (except check analyses) and inspection shall be made at the place of manufacture prior to shipment, unless otherwise specified, and shall be so conducted as to not interfere unnecessarily with the operation of the works.

15.—(*a*) Unless otherwise specified, any rejection based on tests made in accordance with Section 5 shall be reported within five working days from the receipt of samples.

(*b*) Bolts and nuts which show injurious defects subsequent to their acceptance at the manufacturer's works will be rejected, and the manufacturer shall be notified.

16.—Samples tested in accordance with Section 5, which represent rejected bolts and nuts, shall be preserved for two weeks from the date of the test report. In case of dissatisfaction with the results of the tests, the manufacturer may make claim for a rehearing within that time.

Steel and Iron Pipe Specifications

1.—(*a*) All pipe to be used on locomotives and cars shall be of coiling or bending quality.

(*b*) Unless otherwise specified on the purchase order, inspection and all tests except the hydrostatic pressure test shall be made by the purchaser at destination, and at his expense.

2.—(*a*) *Steel Pipe.*—Steel used in the manufacture of pipe shall be of a soft weldable quality made by the bessemer or other approved process.

Table I.

HYDROSTATIC PRESSURE FOR WELDED PIPE.

(Pressure Expressed in Pounds Per Square Inch.)

Inside Diam. in.	Standard Grade Pipe		Extra-Strong Pipe.	
	Butt-Weld.	Lap-Weld.	Butt-Weld.	Lap-Weld.
⅛	700	....	700	....
¼	700	....	700	....
⅜	700	....	700	....
½	700	....	700	....
¾	700	....	700	....
1	700	....	700	....
1¼	700	1,000	1,500	2,500
1½	700	1,000	1,500	2,500
2	700	1,000	1,500	2,500
2½	800	1,000	1,500	2,000
3	800	1,000	1,500	2,000
3½	...	1,000	....	2,000
4	...	1,000	....	2,000
4½	...	1,000	....	1,800
5	...	1,000	....	1,800
6	...	1,000	....	1,800

(*b*) *Wrought Iron Pipe.*—The iron shall be made from muck bars, made from puddled pig iron, free from any admixture of iron scrap or steel.

(*c*) All pipe 3 inches or under in nominal diameter may be butt-welded, unless otherwise specified. All pipe over 3 inches in nominal diameter shall be lap-welded.

3.—*Iron Scrap.*—This term applies only to foreign or bought scrap and does not include local mill products, free from foreign or bought scrap.

4.—The material shall conform to the following minimum requirements as to tensile properties:

	Wrought Iron	Steel
Tensile strength, lb. per sq. in.	45,000	50,000
Yield point, per sq. in.	24,000	30,000
Elongation in 8 in., per cent.	12	18

5.—All pipe shall be tested at the mill to the hydrostatic pressures specified in Table I.

6.—A section of steel pipe 6 inches in length shall be flattened until the maximum distance between the walls is equal to three times the thickness of the material, without developing cracks, except at the weld.

7.—A section of wrought iron pipe 6 inches in length shall be broken by repeated light blows of a hammer or by pressure; the fracture developed shall have a fibrous appearance.

8.—(*a*) For steel pipe, a sufficient length of pipe shall bend cold through 180 degrees around a mandrel the diameter of which is 18 times the nominal diameter of the pipe, without developing cracks in any portion, and without opening at the weld.

(*b*) For wrought iron pipe, the test specified in Paragraph (*a*) shall be omitted, except for coiling or bending pipe.

9.—(*a*) Test specimens shall consist of sections cut from a pipe. They shall be smooth on the ends and free from burrs.

(*b*) Tension test specimens shall be longitudinal.

(*c*) All specimens shall be tested cold.

10.—One of each of the tests specified in Sections 4, 6 or 7, and 8, may be made on a length in each lot of 500 or less, of each size. Each length shall be subjected to the hydrostatic test.

11.—If the results of the physical tests of any lot do not conform to the requirements specified in Sections 4, 6 or 7, and 8, retests of two additional pipes shall be made, each of which shall conform to the requirements specified.

12.—(*a*) The standard weights for pipe of various inside diameters are given in Table II.

(*b*) Nipples shall be cut from pipe of the same weight and quality as described in these specifications.

13.—The weight of the pipe shall not vary more than 5 per cent from that specified in Section 12 (*a*).

14.—(*a*) For pipe 1½ inches or under, the outside diameter, at any point, shall not vary more than 1/64 inch over nor more than 1/32 inch under the standard. For pipe 2 to 6 inches, inclusive, the outside diameter shall not vary more than 1 per cent over nor more than 3/64 inch under the standard.

(*b*) All standard weight pipe shall be provided with the prevailing standard thread, which will make a tight joint when tested

Table II.

STANDARD WEIGHTS

(All Dimensions are Nominal.)

Dimensions			Pipe. Standard-Grade	Pipe. Extra-Strong
Inside Diameter, inches.	Number of Threads per Inch.	Outside Diameter, Inches.	Wt. of Pipe per Lin. Ft., Threaded and with Couplings, lb.	Wt. of Pipe per Lin. Ft., Plain Ends, lb.
⅛	27	0.405	0.25	0.31
¼	18	0.540	0.43	0.54
⅜	18	0.675	0.57	0.74
½	14	0.840	0.85	1.09
¾	14	1.050	1.13	1.47
1	11½	1.315	1.68	2.17
1¼	11½	1.660	2.28	3.00
1½	11½	1.900	2.73	3.63
2	11½	2.375	3.68	5.02
2½	8	2.875	5.82	7.66
3	8	3.500	7.62	10.25
3½	8	4.000	9.20	12.51
4	8	4.500	10.89	14.98
4½	8	5.000	12.64	17.61
5	8	5.563	14.81	20.78
6	8	6.625	19.19	28.57

Adopted at the Atlantic City meeting of the American Society for Testing Materials and passed to the membership for letter ballot.

to the internal hydrostatic pressure at the mill. The threads shall not vary more than one and one-half turns either way, when tested with a Pratt & Whitney standard gage. All burrs at the end of the pipe shall be removed.

(*c*) Unless otherwise ordered, pipe shall be furnished in random lengths of 16 to 22 feet, but not more than 5 per cent of the total number of lengths furnished may be "jointers", which are two pieces coupled together. When ordered with plain ends, 5 per cent may be furnished in lengths of 12 feet or over.

(*d*) Each standard weight pipe shall be provided with a coupling, having clean-cut threads of such a pitch diameter as to make a tight joint. For steel pipe, couplings may be of wrought iron or steel. For wrought iron pipe, couplings shall be of wrought iron.

(*e*) Unless otherwise specified, extra strong pipe shall be furnished in random lengths, with plain ends.

15.—The finished pipe shall be reasonably straight and free from injurious defects.

16.—The inspector representing the purchaser shall have free entry, at all times while work on the contract of the purchaser is being performed, to all parts of the manufacturer's works which concern the manufacture of the pipe ordered. The manufacturer shall afford the inspector, free of cost, all reasonable facilities to satisfy him that the pipe are being furnished in accordance with these specifications.

(*b*) When tests and inspection are made at the place of manufacture, they shall be so conducted as not to interfere unnecessarily with the operation of the works.

17.—Pipe which develops injurious defects in shop working or application will be rejected, and the manufacturer shall be notified.

18.—Samples tested in accordance with Section 1 (*b*), which represent rejected pipe, shall be preserved for two weeks from the date of test report. In case of dissatisfaction with results of the tests, the manufacturer may make claim for a rehearing within that time.

Carbon Steel Splice Bar Specifications

1.—The steel shall be made by the open-hearth process.

2.—The splice bars shall be punched, slotted and, in the case of special designs, shaped at a temperature not less than 750 degrees Cent., and subsequently heat-treated.

3.—The steel shall conform to the following requirements as to chemical composition:

Carbon	not over 0.60 per cent
Manganese	not over 0.80 per cent
Phosphorus	not over 0.04 per cent

4.—An analysis to determine the percentages of carbon, manganese, phosphorus and sulphur shall be made by the manufacturer from a test ingot taken during the pouring of each melt, a copy of which shall be given to the purchaser or his representative. This analysis shall conform to the requirements specified in Section 3. Drillings for analysis shall be taken not less than ½ inch beneath the surface of the test ingot.

5.—Analyses may be made by the purchaser from finished splice bars representing each melt, in which case an excess of 25 per cent above the requirement as to phosphorus specified in Section 3 shall be allowed.

6.—The splice bars shall conform to the following minimum requirements as to tensile properties:

Tensile strength, lb. per sq. inch	100,000
Yield point, per sq. inch	65,000
Elongation in 2 in., per cent	10

7.—The best test specimen specified in Section 8 shall bend cold through 90 degrees around a pin the diameter of which is equal to three times the thickness of the specimen, without cracking on the outside of the bent portion.

Adopted at the Atlantic City meeting of the American Society for Testing Materials and passed to the membership for letter ballot.

8.—Tension and bend test specimens shall be taken from the finished bars. Tension test specimens shall be of the form and dimensions shown in Fig. 1. Bend test specimens may be ½ inch square in section, or rectangular in section with two parallel faces as rolled, with corners rounded to a radius not over 1/16 inch.

9.—If preferred by the manufacturer and approved by the purchaser, the following bend test may be substituted for that described in Section 7: A piece of the finished bar shall bend cold through 45 degrees around a pin the diameter of which is equal to three times the greatest thickness of the section, without cracking on the outside of the bent portion.

10.—(*a*)—One tension and one bend test shall be made from each melt.

(*b*) If any test specimen shows defective machining or develops flaws, it may be discarded and another specimen substituted.

(*c*) If the percentage of elongation of any tension test specimen is less than that specified in Section 6 and any part of the fracture is more than ¾ inch from the center of the gage length, as indicated by scribe scratches marked on the specimen before testing, a retest shall be allowed.

11.—If the results of the physical tests of any test lot do not conform to the requirements specified, the manufacturer may retreat such lot one or more times and retests shall be made as specified in Section 10.

12.—The splice bars shall be smoothly rolled, true to templet, and shall accurately fit the rails for which they are intended. The bars shall be sheared to length, and the punching and notching shall conform to the dimensions specified by the purchaser. A variation of 1/32 inch from the specified size of holes, of 1/16 inch from the specified location of holes, and of ⅛ inch from the specified length of splice bar, will be permitted. Any variation from a straight line in a vertical plane shall be such as will make the bars high in the center. The maximum camber in either plane shall not exceed 1/16 inch in 24 inches.

13.—The finished splice bars shall be free from injurious defects and shall have a workmanlike finish.

14.—The name or brand of the manufacturer and the year of manufacture shall be rolled in raised letters and figures on the side of the rolled bars, and a portion of this marking shall appear on each finished splice bar.

15.—The inspector representing the purchaser shall have free entry, at all times while work on the contract of the purchaser is being performed, to all parts of the manufacturer's works which concern the manufacture of the splice bars ordered. The manufacturer shall afford the inspector, free of cost, all reasonable facilities to satisfy him that the splice bars are being furnished in accordance with these specifications. All tests (except check analyses) and inspection shall be made at the place of manufacture prior to shipment, unless otherwise specified, and shall be so conducted as not to interfere unnecessarily with the operation of the works.

16.—(*a*) Unless otherwise specified, any rejection based on tests made in accordance with Section 5 shall be reported within five working days from the receipt of samples.

(*b*) Splice bars which show injurious defects subsequent to their acceptance at the manufacturer's works will be rejected, and the manufacturer shall be notified.

17.—Samples tested in accordance with Section 5, which represent rejected splice bars, shall be preserved for two weeks from the date of the test report. In case of dissatisfaction with the results of the tests, the manufacturer is entitled to present his claim for a rehearing within that length of time.

Specifications for Chain

1.—(*a*) These specifications cover two classes of iron and one class of steel chain.

Class A, wrought iron chain, is of the quality generally sold under the trade designation "Crane Chain";

Class B, wrought iron or steel chain, is of the quality generally sold under the trade designation of "Ordinary Coil Chain".

(*b*) The purposes for which these classes are generally used are as follows:

Class A, for slings, railway cranes, hoists and other places where a failure on the part of the chain used would imperil human life.

Class B, for ordinary service.

2.—(*a*) *Class A, Iron Chain*, shall be manufactured from wrought iron which has been made wholly from puddled iron, free from any admixture of steel or scrap containing steel.

(*b*) *Class B, Iron Chain*, shall be manufactured from a grade of wrought iron conforming to the requirements of the Standard Specifications for Refined Wrought Iron Bars (Serial Designation: A 41), of the American Society for Testing Materials.

(*c*) *Class B, Steel Chain*, shall be manufactured from steel made by the open hearth process, which shall be ductile and of satisfactory welding quality.

Adopted at the Atlantic City meeting of the American Society for Testing Materials and passed to the membership for letter ballot.

3.—The wrought iron and steel used in the manufacture of chain of the respective classes referred to in this paragraph shall conform to the following requirements as to chemical composition:

CLASS A.

	Iron.
Manganese	Not over 0.10 per cent
Phosphorus	....
Sulphur	....

CLASS B.

	Iron.	Steel.
Manganese	....	....
Phosphorus	....	Not over 0.05 per cent
Sulphur	....	Not over 0.05 per cent

Table III.

TENSILE PROPERTIES OF CHAINS

Diameter of bar, inches.	—Class A.— —Iron.— Breaking,	Elonga-tion,	——Class B.—— —Iron.— Breaking,	Elonga-tion,	—Steel.— Breaking,	Elonga-tion,
			Class A.	Class B.	Class A.	Class B.
¼	3,700	15	3,000	10	3,300	12
5/16	5,800	15	4,800	10	5,300	12
3/8	8,200	15	6,800	10	7,500	12
7/16	11,200	15	9,400	10	10,200	12
½	14,600	15	12,200	10	13,400	12
9/16	18,400	15	15,600	10	17,000	12
5/8	23,000	15	19,200	10	21,000	12
11/16	26,800	15	23,200	10	25,000	12
¾	33,000	15	27,600	10	30,200	12
13/16	38,800	15	31,600	10	35,200	12
7/8	45,000	15	37,600	10	41,200	12
15/16	51,600	15	42,400	10	47,000	12
1	58,800	15	49,000	10	53,800	12
1 1/16	66,400	15	55,200	10	60,800	12
1⅛	74,400	15	62,000	10	68,200	12
1¼	92,000	15	76,600	10	84,200	12
1 3/16	112,000	15	.....	..	.....	..
1½	132,400	15	.....	..	.....	..
1 5/8	138,200	15	.....	..	.....	..
1¾	165,000	15	.....	..	.....	..
1 7/8	190,000	15	.....	..	.....	..
2	216,000	15	.....	..	.....	..

4.—(*a*) Analyses may be made by the purchaser from finished chain, which shall conform to the requirements specified in Section 3.

(*b*) Drillings for analysis shall be taken with a drill the diameter of which is approximately one-half the diameter of the bar from which drillings are being taken, and the cuttings shall be taken through the bar from surface to surface.

5.—(*a*) All chain shall be proof-tested by subjecting it to the loads shown in Table V, and when so tested it shall stand these loads without showing any defects.

(*b*) When requested, the manufacturer shall furnish a certificate of proof-test to the purchaser or his representative.

6.—Samples from finished chain shall conform to the minimum requirements as to tensile properties specified in Table III, the elongation being determined in a gage length of from 12 to 18 inches to the nearest link.

7.—Tension test specimens shall consist of a length not less than 2 feet cut from the finished chain.

8.—One tension test shall be made to represent each 200 feet or fraction thereof ordered.

9.—If the tension test fails to conform to the requirements specified in Section 6, two additional tension tests may be made, each of which shall meet the requirements of Section 6.

10.—(*a*) The nominal weights and maximum lengths of 100 links for chain of various sizes are given in Table IV.

(*b*) The weight of the chain shall not vary more than 3 per cent over nor more than 5 per cent under the nominal weight specified in Table IV. Excess weight over the permissible variation of 3 per cent will not be paid for.

(*c*) The length shall be measured after the chain has been proof-tested, and shall be measured to the inside of the end links.

(*d*) In determining the length of the chain, a load not exceeding 10 per cent of the proof load specified in Table V shall be applied to take up the slack.

11.—(*a*) The chain shall be free from injurious defects and shall have a workmanlike finish. The diameter at the welds shall not be perceptibly less than the diameter of the bar and, unless otherwise specified, shall not exceed the diameter of the bar by more than 25 per cent.

(*b*) Prior to testing and inspection the chain shall be free from paint or any other coating which would tend to conceal defects.

12.—(*a*) The inspector representing the purchaser shall have free entry, at all times while work on the contract of the purchaser is being performed, to all parts of the manufacturer's works which concern the manufacture of the material ordered. The manufacturer shall afford the inspector, free of cost, all reasonable facilities to satisfy him that the material is being furnished in accordance with these specifications.

(*b*) The purchaser may make the tests to govern the acceptance of the material at his own laboratory, or elsewhere. Such tests, however, shall be made at the expense of the purchaser.

(*c*) Tests and inspection shall be so conducted as not to interfere unnecessarily with the operation of the works.

13.—Unless otherwise specified, any rejection based on tests made in accordance with Section 12 (*b*) shall be reported within five working days from receipt of samples.

Table IV.

WEIGHTS OF CHAIN

Diameter of bar, inches.	load, lb.	per cent.	Maximum lengths of 100 links, in. load, lb.	per cent.	Nominal weight per 100 ft., lb. load, lb.	per cent.
¼			88	102	83	75
5/16			100	114.7	125	110
3/8			113	125	175	165
7/16			125	137.5	220	205
½			140	150	280	265
9/16			150	166	360	325
5/8			170	176	450	425
11/16			185	195	540	520
¾			200	213	625	610
13/16			213	225	745	725
7/8			225	238	850	810
15/16			238	250	960	925
1			250	263	1,075	1,025
1 1/16			265	295	1,240	1,225
1⅛			280	325	1,410	1,350
1¼			315	353.5	1,750	1,650
1 3/8			355	...	2,100	.....
1½			390	...	2,450	.....
1 5/8			425	...	2,875	.....
1¾			475	...	3,200	.....
1 7/8			525	...	3,640	.....
2			575	...	4,200	.....

Table V.

LOADS ON CHAINS.

Diameter of Bar, inch.	Proof-Test Loads, lb. Class A. Iron.	Class B. Iron.	Class B. Steel.
¼	1,850	1,500	1,650
5/16	2,900	2,400	2,650
3/8	4,100	3,400	3,750
7/16	5,600	4,700	5,100
½	7,300	6,100	6,700
9/16	9,200	7,800	8,500
5/8	11,500	9,600	10,500
11/16	13,400	11,600	12,500
¾	16,500	13,800	15,100
13/16	19,400	15,800	17,600
7/8	22,500	18,800	20,600
15/16	25,800	21,200	23,500
1	29,400	24,500	26,900
1 1/16	33,200	27,600	30,400
1⅛	37,200	31,000	34,100
1¼	46,000	38,300	34,100
1 3/16	56,000	.....	.....
1½	66,200	.....	.....
1 5/8	69,100	.....	.....
1¾	82,500	.....	.....
1 7/8	95,000	.....	.....
2	108,000	.....	.....

Malleable Castings Specifications

These specifications are intended for general use, and in particular for railroad malleable iron castings, for which purpose they will be designated when additional specifications for other classes of malleable iron castings shall be adopted. Approved and passed to letter ballot at Atlantic City meeting, American Society for Testing Materials, June 22-25.

The castings shall be made from iron melted in either an air, open hearth or electric furnace. Tension test specimens shall meet the following minimum requirements as to tensile properties:

Tensile strength, lb. per sq. in.... 38,000
Elongation in 2 in., per cent..... 5

Transverse test specimens, tested with the cope side up on supports 12 inches apart, pressure being applied at the center, shall conform to the following requirements as to transverse properties:

Thickness of specimen, inch	Minimum load applied at center, pounds	Minimum deflection at center, inches
½	900	1.25
5/8	1,400	1.00
¾	2,000	0.75

In addition to the tension and transverse tests, the inspector representing the purchaser

may satisfy himself of the suitability of the iron used for the castings by breaking a reasonable number of castings before annealing to examine for excessive mottling or graphite spots. In the case of castings of special design or importance, he may also require test lugs of a size proportional to the thickness of the castings but not exceeding ⅝ by ¾ inch in section. At least one of these lugs shall be left on the casting for final inspection.

Tension test specimens shall be of the form and dimensions shown in the accompanying illustration, Fig. 2. Transverse test specimens shall be 14 inches in length by 1 inch in width and either ½, ⅝ or ¾ inch in thickness. The thickness of the specimen selected shall be in proportion to the thickness of the casting which it represents.

Two tension and two transverse test specimens shall be cast in each mold with risers of sufficient height at each end to secure sound bars. All specimens shall be cast without chills, and with ends perfectly free in the mold.

Four molds shall be poured to represent each melt. When the entire melt is used for castings which are subject to these specifications, two molds shall be poured within five minutes after tapping into the first ladle, and two molds from the last iron of the melt. When only part of the melt is required for such castings, two molds shall be poured from the first ladle of iron used and two molds after the required iron has been tapped.

The molds shall be suitably stamped to identify the specimens.

The test specimens from one mold from the first and one mold from the last of the melt shall be annealed in the hottest part of the annealing oven, and the remaining specimens shall be annealed in the coldest part.

rejected.

The castings shall substantially conform to the sizes and shapes of the patterns, and shall be made in a workmanlike manner. A variation of 3/32 inch per foot will be permitted.

The castings shall be free from blemishes, scale and shrinkage cracks.

The inspector representing the purchaser shall have free entry, at all times while work on the contract of the purchaser is being per-

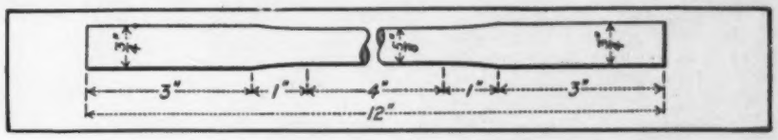


FIG. 2—TENSILE TEST SPECIMEN FOR MALLEABLE IRON

One tension and one transverse test specimen from each of the four molds representing a melt shall be selected for test. The remaining specimens shall be reserved, and shall be tested in case of failure to conform to the requirements specified.

If more than one tension or transverse test specimen from each of the two molds annealed in the two points in the oven fail to meet the requirements as to tensile or transverse properties, the castings from that melt will be

formed, to all parts of the manufacturer's works which concern the manufacture of the castings ordered. The manufacturer shall afford the inspector, free of cost, all reasonable facilities to satisfy him that the castings are being furnished in accordance with these specifications. All tests and inspection shall be made at the place of manufacture prior to shipment, unless otherwise specified, and shall be so conducted as not to interfere unnecessarily with the operation of the works.

Specifications for Cold Drawn Steel

1.—These specifications cover a free-cutting steel of any specified section suitable for high-speed screw machine work, leaving a smooth finish after machining.

2.—The steel shall be made by the open hearth process, and shall be cold-rolled or cold-drawn or turned to size.

3.—The steel shall conform to the following requirements as to chemical composition:

Carbon	0.15 -0.25 per cent
Manganese	0.60 -0.90 per cent
Phosphorus	not over 0.06 per cent
Sulphur	0.075-0.15 per cent

4.—Samples for analysis shall be taken by machining off the entire cross-section of the bar, or by drilling parallel to the axis of the bar at any point midway between the center and surface with a drill not under ½ nor over ¾ inch in diameter. Samples shall be clean, free from oil, uniformly fine and well mixed.

5.—The variation from the specified diameter, or distance between parallel faces, and the allowable eccentricity shall not exceed the limits shown in the accompanying table.

PERMISSIBLE VARIATIONS.

Diameter.	Over-size.	Under-size.	Eccentricity.
Up to and including 0.3 in.	0	1 % of diam.	0.5 % of diam.
Over 0.3 in. to and including 1 in.	0	0.003 in.	0.0015 in.
Over 1 in. to and including 2½ in.	0	0.004 in.	0.0020 in.
Over 2½ in.	0	0.005 in.	0.0025 in.

6.—The material shall be free from injurious defects and shall have a bright, smooth surface.

7.—The manufacturer shall afford the inspector representing the purchaser, free of cost, all reasonable facilities to satisfy him that the material is being furnished in accordance with these specifications.

8.—Material which fails to conform to the above specifications will be rejected, and the manufacturer shall be notified.

Adopted at the Atlantic City meeting of the American Society for Testing Materials and passed to the membership for letter ballot.

Boiler Tube Specifications

1.—(*a*) Lap-welded tubes shall be made of open hearth steel or knobbled hammered charcoal iron.

(*b*) Seamless tubes shall be made of open-hearth steel.

2.—(*a*) The steel shall conform to the following requirements as to chemical composition:

Carbon	0.08-0.18 per cent
Manganese	0.30-0.50 per cent
Phosphorus	Not over 0.4 per cent
Sulphur	Not over 0.045 per cent

(*b*) Chemical analysis will not be required for charcoal-iron tubes.

3.—(*a*) Analyses of two tubes in each lot of 250 steel tubes (or in the total order if less than 250) may be made by the purchaser, which shall conform to the requirements specified in Section 2. Drillings for analyses shall be taken from several points around each tube.

(*b*) If the analysis of only one tube does not conform to the requirements specified, analyses of two additional tubes from the same lot shall be made, each of which shall conform to the requirements specified.

4.—(*a*) A test specimen not less than 4 inches in length shall have a flange turned over at right angles to the body of the tube, without showing cracks or flaws. This flange, as measured from the outside of the tube, shall be ¾ inch wide for steel and 1/16 inch wide for iron tubes.

(*b*) In making the flange test, the flaring tool and die block shown in Fig. 3 may be used.

5.—A test specimen 3 inches in length shall stand hammering flat until the inside walls are brought parallel and separated by a distance equal to three times the wall thickness, without showing cracks or flaws. In the case of lap-welded tubes, the test shall be made with the weld at the point of maximum bend.

6.—Tubes under 5 inches in diameter shall stand an internal hydrostatic pressure of 1,000 pounds per square inch; and tubes 5 inches or over in diameter shall stand an internal hydrostatic pressure of 800 pounds per square inch. Lap-welded tubes shall be struck near both ends, while under pressure, with a 2-pound hand hammer or the equivalent.

7.—A cross-section of charcoal iron tube may be turned or ground to a perfectly true surface, polished free from dirt or cracks, and etched until the soft parts are sufficiently dissolved for the iron tube to show a decided

Adopted at the Atlantic City meeting of the American Society for Testing Materials and passed to the membership for letter ballot.

ridged surface, with the weld very distinct, while a steel tube would show a homogeneous surface.

8.—(*a*) All test specimens shall be taken from tubes before being cut to finished lengths and shall be smooth on the ends and free from burrs.

(*b*) All specimens shall be tested cold.

9.—One flange and one flattening test shall be made from each of two tubes in each lot of 250 or less. Each tube shall be subjected to the hydrostatic test.

10.—If the results of the physical tests of only one tube from any lot do not conform to the requirements specified in Sections 4 or 5, retests of two additional tubes from the same lot shall be made, each of which shall conform to the requirements specified.

11.—(*a*) Finished tubes 3½ inches or under in diameter shall be circular within 0.02 inch and the mean outside diameter shall not vary more than 0.015 inch from the size ordered. For tubes over 3½ inches in diameter, these variations shall not exceed 0.5 per cent of the outside diameter.

The measurements to determine whether the tubes meet these requirements shall be made near the ends of the tubes.

(*b*) All tubes shall be gaged with a B.w.g. gage and shall not be less than the thickness specified, except that tubes will be accepted on which the gage will go on tightly at the thinnest point.

The length shall not be less, but may be 0.125 inch more than that ordered.

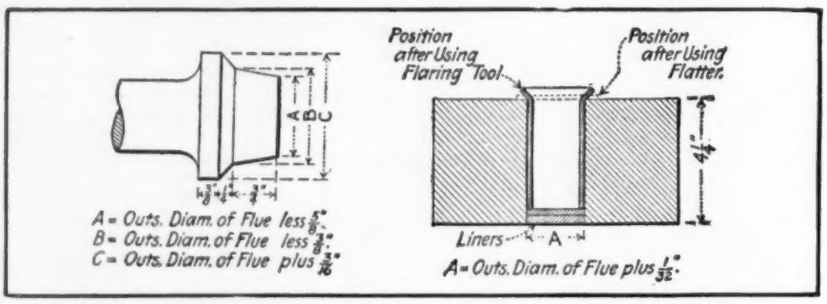

Position after Using Flaring Tool
Position after Using Flatter
A = Outs. Diam. of Flue less 5/8"
B = Outs. Diam. of Flue less 3/8"
C = Outs. Diam. of Flue plus 3/16"
Liners
A
A = Outs. Diam. of Flue plus 1/32"

FIG. 3—FLARING TOOL AND DIE BLOCK FOR BOILER TUBES

12.—The finished tubes shall be free from injurious defects and shall have a workmanlike finish. They shall be practically free from kinks, bends and buckles.

13.—The name or brand of the manufacturer, the material from which it is made, whether steel or charcoal iron, and "Tested at 1,030 pounds" for tubes under 5 inches in diameter and "Tested at 800 pounds" for tubes 5 inches or over in diameter, shall be legibly stenciled on each tube.

14.—Inspection and all tests except check analyses shall be made at the place of manufacture. The manufacturer shall furnish the purchaser of each lot of tubes a statement of the kind of material of which the tubes are made, and that the tubes have been tested and have met all the requirements of the specifications.

15.—Tubes when inserted in the boiler shall stand expanding and beading without showing cracks or flaws, or opening at the weld. Tubes which fail in this manner will be rejected and the manufacturer shall be notified.

The Western Reserve Steel Co., Warren, O., has purchased a 10-ton electric crane from the Shaw Electric Crane Co., New York City.

Empire Electric Manufacturing Co., Chicago, has increased its capital from $5,000 to $25,000.

At Cleveland

Fall Meeting of American Iron and Steel Institute Will Be Held

Cleveland will entertain the fall meeting of the American Iron and Steel Institute on Oct. 22 and 23, according to a decision of the directors at New York, June 25. The selection of the hotel and other arrangements will be left in the hands of a local committee to be appointed later.

Seventeen new members were added to the list by the directors. These are as follows:

ACTIVE MEMBERS.

Thomas R. Akin, president, Laclede Steel Co., St. Louis.

Henry K. Bourne, Oglebay, Norton & Co., Cleveland.

George L. Collord, manager, blast furnace department, the Shenango Furnace Co., Sharpsville, Pa.

Robert F. Gross, sales manager, pig iron department, Pennsylvania Steel Co., Philadelphia.

Henry Hess, president, Hess Steel Casting Co., Philadelphia.

Robert W. Hunt, Chicago.

Roy A. Lewis, assistant general superintendent, Saucon plant, Bethlehem Steel Co., South Bethlehem, Pa.

John McConnell, general superintendent, United Steel Co., Canton, O.

Herman Edward Townsend, superintendent, open hearth department, Carnegie Steel Co., Clairton, Pa.

ASSOCIATE MEMBERS.

John G. Bergquist, consulting engineer, Glen Head, N. Y.

John L. W. Birkinbine, Philadelphia.

Arthur Edward Danforth, Oglebay, Norton & Co., Cleveland.

Albert C. Lehman, president, Blaw Steel Construction Co., Pittsburgh.

Charles M. Muchnic, vice president, American Locomotive Sales Corporation, New York City.

E. C. Patterson, secretary and general manager, Chattanooga Boiler & Tank Co., Chattanooga, Tenn.

James Philip Thomas, general manager, A. J. Haus & Sons, Ltd., Johnstown, Pa.

Jay G. Weiss, Hyatt Roller Bearing Co., Harrison, N. J.

The Wright Wire Co. has closed its No. 3 mill at Palmer, Mass., and will move the machinery to the main plant at Worcester. The plant has been in operation for about nine years.

All Stacks

Now in Operation at Gary—Mill Activity Increasing

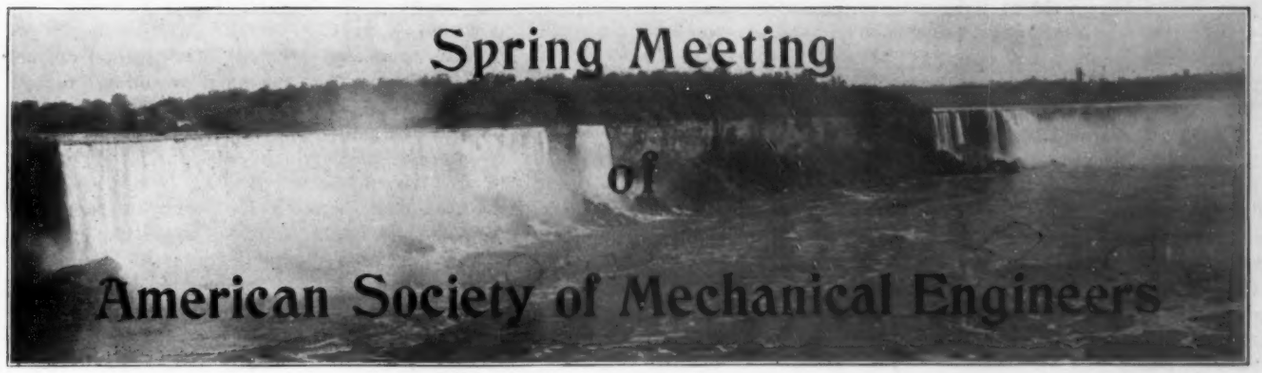
Chicago, June 29.—The eighth blast furnace at the Illinois Steel Co.'s works at Gary, Ind., has been blown in, making active the entire blast furnace capacity of this plant. The plant has been operating 32 of its 42 open hearths and with the last blast furnace active practically all the remainder of the open hearths will be put into service except such as are under reconstruction. This makes Gary operating at virtually 100 per cent as far as its ingot capacity is concerned.

Activity in the mills is also on the increase and both the rail mill and those turning out slabs, billets, bars and axles are adding to their rolling schedules.

Inland Steel Co. is operating both its blast furnaces and 11 of its 12 open hearths. Its mill capacity is not running full, but comes close to that condition, except as to sheets. Twelve of the 18 sheet mills are now operating, the lack of galvanized business being responsible for the other six being idle.

Another Benzol Plant Contracted

Another important addition to the increasing list of benzol plants being erected in this country has been made by a contract just awarded by the Lehigh Coke Co. for the installation of such a unit in connection with its by-product coke works at South Bethlehem, Pa. The new benzol plant will be of the Carl Still type and will produce crude benzol, toluol, zylol, solvent naphtha and other distillates from coke oven gas. The plant will be erected on property acquired by the Lehigh Coke Co., adjacent to its coke works. It will have a capacity of taking care of the gas from 3,900 gross tons of coal a day, which is the fuel consumed in the two batteries, or 212 by-product coke ovens of the Koppers type, comprising the present Lehigh Coke Co. plant. The benzol installation will be so laid out that it can readily be duplicated to accommodate the gas from 212 additional ovens now under construction. If this latter plan is carried out, the benzol unit will be one of the largest in the country. Alfred Kuhn will have charge of the erection of the plant.



TRIBUTE to the engineer as a pioneer in human achievement and as a dreamer of dreams that come true and make the world better was paid by prominent speakers who welcomed the American Society of Mechanical Engineers to Buffalo for its spring sessions last week.

The meeting extended from Tuesday, June 22, to Friday, June 25, professional sessions being held both in Buffalo and Niagara Falls. Frank B. Baird, representing the industries of Buffalo, in his address at the Tuesday evening reception pictured the first engineer as the primitive man who originated the two-wheeled cart and showed that foremost in the ranks of pathfinders through the ages had been the men of this profession. In his response, Dr. John A. Brashear, president of the society, spoke feelingly of the great debt the successful engineer owes to the woman whose devotion made possible his achievement. In his usual happy and humorous vein, Dr. Brashear related many incidents of early scientific efforts in America. Of especial interest was his account of the building of this country's first telescope by himself and his wife, in spare hours after his day's work in a Pittsburgh rolling mill.

Illustrating the theme that the engineer occupies the outposts of progress, Dr. F. H. Newell, head of the department of civil engineering, University of Illinois, and formerly chief of the national reclamation service, described the work being done by the government in redeeming western arid lands. Many of the papers read during the meeting emphasized the pathfinding phase of engineering by their exhaustive thoroughness of research into new and abstruse fields.

The first professional session was held Wednesday morning in the auditorium of the Shredded Wheat Co.'s factory at Niagara Falls, following a business meeting in which constitutional amendments regarding the formation of nominating committees and the copyright and publication of papers prepared by members, were presented from the council. Members were urged to attend the sessions of the International Engineering Congress at the Panama-Pacific Exposition, San Francisco, Sept. 20-25. The report of the nominating committee was as follows: For president, D. S. Jacobus, New York; for vice presidents, W. B. Jackson, Chicago; J. Sellers Bancroft, Philadelphia, and Julian Kennedy, Pittsburgh. For managers, John Barr, New York; John A. Stevens, Lowell, Mass., and H. D. B. Parsons, New York. For treasurer, W. H. Wylie, New York. These nominations will be acted upon at the December meeting. The report of the committee on standardization of special threads for fixtures and fittings was presented in pamphlet form.

Furnaces for Vertical Boilers

Four papers were read at the Wednesday morning session. The first, by F. W. Dean, discussed "The Use of Corrugated Furnaces for Vertical Fire-Tube Boilers". Mr. Dean considered as advantages of corrugated furnaces the absence of staybolts and the slight amount of elasticity present. He also enlarged upon the variety of sizes obtainable and upon the horsepower that can be realized from furnaces of the largest size now made, stating several points to be borne in mind when designing such furnaces. He described the behavior of corrugated furnaces under hydrostatic test, and the proper method of flanging the fire door opening. Illustrations of two boilers with such furnaces, now in use, were given. In a written discussion of the paper, W. F. MacGregor, suggested that, "Before abandoning the stayboltage system, we must consider its merits as well as its defects. It is strengthened by deformations which tend to weaken corrugated boilers. Leakage at staybolts or slight bulging of plates is sometimes a blessing in disguise." Without exact data, Mr. MacGregor thought the corrugated type to be the more expensive, adding that he believed the most apparent advantages of this furnace in a vertical fire tube boiler were decreased resistance to circulation and increased facilities for cleaning.

Professor H. Wade Hibbard objected to the use of the diagonal stay shown in the author's second diagram, and quoted from the latter's paper to show that the top part of this stay would be at a blue heat, at which iron and steel are brittler than at higher or lower temperatures. The stay, bending as pressures varied, would, in his opinion, be liable to breakage. F. E. Cardullo suggested that the diagonal stay could be eliminated by making the top part of the furnace conical.

The next paper, "A Study of an Axle Shaft for a Motor Truck," by John Younger, was published in last week's issue of *The Iron Trade Review*. It elicited considerable discussion and its author was cordially commended for his researches in the little explored field of the the effect of heat treatment on alloy steels. Cornelius T. Myers, in a written review of the paper, emphasized the importance to the engineering profession of keeping in close touch with original work done in the automobile industry. A written discussion submitted by Radcliffe Furness urged engineers to study the physical properties of steel in conjunction with the work they intend it to perform. If alloy steels properly heat treated are indispensable in motor truck work, he pointed out, the converse is true, that improperly treated alloy steels are positively dangerous. "In the fabrication of any steel forging," he wrote, "one is obliged to heat the steel above the critical temperature, which is the temperature at which remarkable changes take place in the molecular arrangement; and as the final physical properties of the steel depend on the rate at which it cools through the critical range, the number of degrees it is heated above the critical range, or the

time it has been held at temperatures above the critical range, one can readily see that when forgings are manufactured, material is also actually being heat treated.

"Alloys are added to steel," he continued, "because they emphasize changes in the molecular arrangement brought about by heat treatment, thus improving the physical properties which can be obtained from the material in hand." Forgings given no definite heat treatment and turned out at varying rates, he concluded, had small chance of uniformity. It appeared more necessary to heat treat alloy steels than simple carbon steels.

Accelerometer Tests

During the oral discussion which followed, Mr. Younger said that, as the result of accelerometer tests made with a motor truck in actual use, he believed the resultant stress to be a material summation of the two stresses on either side of the normal line. He thought the elastic limit to be actually no more than half or two-thirds of what we get from laboratory tests, and pronounced testing machines of all kinds to be of little value as compared with real working tests.

Other interesting papers read at this session were, "A Comparison of the Properties of Nickel, Carbon and Manganese Steel Before and After Heat Treatment," by Robert R. Abbott; and a treatise "On Measuring Gas Weights", by Thomas E. Butterfield. Mr. Abbott's paper is published elsewhere in this issue. A letter by Arthur West, commending Mr. Butterfield's work, was read, and F. E. Cardullo suggested that if the society adopted the author's views favoring the expression of gas quantities in weight rather than in volume measure, some of the nomenclature should be altered.

Wednesday afternoon was spent in exploring the beauties of Niagara Falls and various points of interest on the Canadian and American sides of the Niagara river, and in inspecting the numerous power plants and factories in the vicinity.

Simultaneous professional sessions were held Thursday morning, one of these taking up three papers and the other four. At the first were read, "A Basis for Rational Design of Heat Transfer Apparatus," by Lieut. E. E. Wilson, U. S. N.; "The Influence of Disk Friction on Turbine Pump Design," by F. zur Nedden; and "The Surface Condenser," by C. F. Braun.

Lieut. Wilson's paper was discussed in writing by Prof. Robert C. H. Heck and Leo Loeb, and orally by C. F. Braun and Prof. H. Wade Hibbard. The author emphasized the viscosity of the circulating water as an important and hitherto neglected variable in tests of feed water heaters and condensers, which have proved so inconsistent as to preclude the formulation of a rational basis for design. He presented an incorporation of various factors in a form giving the area of the heating surface required to transmit a given quantity of heat under the given flow conditions, in a condenser or feed water heater. The discussion which followed developed opposition to several of the statements presented, and it was generally acknowledged that the subject demanded much more investigation. "It appears that in the near future," wrote Mr. Loeb, "most apparatus will embody constructive principles making it impossible to base results on either velocity or diameter."

In reviewing turbine pump design, Mr. zur Nedden stated that the ordinary roughness of non-machined castings has no perceptible effect on efficiency except with high lift pumps, and that painting or japanning the surfaces seems generally less desirable than machining with a medium heavy cut. High polish seems wasted. Numerous suggestions regarding refinement of design, derived from experiment, were given. Diagrams were shown on a screen to compare the experimental work of Rossiter, Biel-Hesse and Gibson-Ryan on various surfaces of discs and casings, and the author employed an ingenious mathematical argument to show Rossiter's conclusions incorrect. He emphasized the need of viscosity measuring instruments at the present time. Among those who discussed his paper were C. George de Laval and M. D. Hersey. C. F. Braun's ably prepared paper was heard with interest, B. E. Reynolds discussing his conclusions as to the modern theory and practice of the surface condenser.

Papers on Cement

The papers read at the simultaneous session on Thursday included, "Some Mechanical Features of the Hydration of Portland Cement and the Making of Concrete as Revealed by Microscopic Study," by Nathan C. Johnson; "Design of Rectangular Concrete Beams," by Howard Harding; "Model Experiments and the Forms of Empirical Equations," by Edgar Buckingham; and "The Effect of Relative Humidity on an Oak Tanned Leather Belt," by W. W. Bird and F. W. Roys. Among those who discussed Mr. Buckingham's presentation of the dimensional method of reasoning in devising empirical equations and in planning and interpreting experiments, were M. Nusim, M. D. Hersey, A. R. Dodge, L. W. Wallace, J. R. Freeman and Frank C. Gilbreth. Mr. Johnson's paper also created considerable discussion, the speakers including G. A. Rankin, H. F. Porter, Dr. F. H. Newell and others. The paper on leather belting, which was published in last week's issue of *The Iron Trade Review*, was received with interest, Carl G. Barth writing to commend the authors for their research. Mr. Barth said that he hoped to continue the authors' experiments. Others who discussed this paper were A. F. Nagle, G. N. Van Oerhuf and F. C. Gilbreth, it appearing to be the concensus of opinion that belt tighteners should also be known as belt looseners, the idler pulley being used to enable the belt to run at as low a tension on the slack side as possible. Automatic spring-loaded tighteners keep belts at the best tension and achieve the best results generally.

Inspection Trips

Thursday afternoon was given over to the inspection of Buffalo manufacturing plants and points of interest, and a tea was given the ladies and members by the Twentieth Century Club. An enjoyable reception and dance took place Thursday evening.

The final professional session took place Friday morning, and the following papers were read: "Laps and Lapping," by W. A. Knight and A. A. Case; "The Relation Between Production and Costs," by H. L. Gantt. The former is published elsewhere in this issue. A paper on "The Laws of Lubrication of Journal Bearings,' was presented by M. D. Hersey. Considerable discussion, written and oral, took place. Mr. Hersey's paper showed that the dynamical characteristics of the bearing, and the thermal characteristics of the lubricant and the cooling system, are independent parts of the problem and may be separately investigated. It closed with an analysis of "the ideal bearing". A report by the boiler code committee regarding authorization of the use of the society stamp, and asking that the committee be empowered to take up the subjects of economizers and rules for operating steam boilers and pressure vessels, was submitted. The spring meeting was brought to a close with the further inspection of manufacturing plants and numerous manufacturing plants and various social functions for members and their guests.

Members of the Engineers' Society of Western Pennsylvania inspected the plant of the Pennsylvania Rubber Co., at Jeannette, Pa., on Saturday, June 26.

News of Employers and Employes

Retirement of Secretary Hogan—General Agent of Carpenters' Union in New York Being Prosecuted in Police Court

To protect the products of open shop manufacturers against boycotting by labor unions, Chas. H. Bausher, general agent of the district council of the United Brotherhood of Carpenters and Joiners, is being prosecuted in the police court in New York City on a charge of conspiracy to injure trade under the anti-trust and penal laws. Other officers of the union are to be tried. John Bossert, of Louis Bossert & Son, large manufacturers of sash, doors and blinds, makes the complaint that his business in Manhattan, formerly amounting to more than $300,000 a year, has been reduced to almost nothing by the acts of the union. It is charged there is in existence an alliance between union officials and manufacturers running closed shops for checking the sale of openshop products. These manufacturers, it is alleged, employ spies to watch the sale of non-union materials and when it is found these are going into buildings, the unions are notified and a strike is threatened. Such action usually leads to an agreement between the contractor and the union that only union material will be used in the future under penalty of a fine of $2,500. Walter C. Merritt, counsel of the American Anti-Boycott Association, who is conducting the prosecution, says this action is part of a general effort of the manufacturers to resist attempts to monopolize the markets of any city through such means and the result promises to be of much importance. The unions are charged with having violated court injunctions against their practices granted to Bossert & Sons.

Secretary Hogan Retires

"We never have had a strike," said Thomas J. Hogan, of Chicago, as he laid down his duties as secretary of the Stove Founders National Defense Association, after 25 years service. Mr. Hogan's services were so highly regarded that the association voted him a parting gift of $2,500 as a testimonial of esteem. He declined reelection to his position and has been succeeded by Robert W. Sloan, of Pittston, Pa., who will establish the headquarters of the association at Scranton, Pa.

Mr. Hogan's career as secretary of this organization of stove manufacturers has been remarkable and the results he has been able to bring about are unusual. Peaceful bargaining has been his plan and as time has gone on there have been fewer occasions each year to take up and settle differences of opinion.

Mr. Hogan learned the trade of molder with the Co-operative Stove Co., at Troy, N. Y., and soon acquired stock in that company. He was made a member of Local No. 2 of the molders union in May, 1872, and in January, 1874, he was issued an honorary card in the union, which he still

THOMAS J. HOGAN

carries and exhibits with pride, though it is severely worn by the 40 years of vicissitudes through which it has passed. He became secretary of the stove company and later secretary of the Troy Foundrymens Association, and when the Stove Founders National Defense Association was organized, he was its first secretary. Later he resigned to enter business, but when his successor resigned he was persuaded to resume the duties and rounded out 25 years of service when he resigned a short time ago.

It is said that in his capacity as secretary of the association he took part in the adjustment of more industrial disputes than any other person in a similar position and few men remain in the business as employer who were active when he began his duties. His experience as a molder and member of the molders organization and his experience as an employer gave him a balanced view of the situation, and with rare judgment he was able to maintain an even poise that assisted materially in settling disputes.

Though he has been in active work for 48 years, Mr. Hogan does not seem old and apparently has many years of life remaining which he hopes to spend quietly in his handsome home at 5252 Washington boulevard, Austin, Chicago, surrounded by his children and grandchildren.

Present Wage Scale to Prevail

During the year beginning July 1, men employed in mills controlled by the Amalgamated Association of Iron, Steel and Tin Workers, will work at wage rates prevailing the last 12 months. At joint conferences held the last fortnight at Atlantic City, representatives of the Amalgamated Association lost in their fights to obtain advanced wages for sheet mill, tin plate mill and iron mill members.

In the preambles to the scales for the sheet and tin plate mill men, the words "Pittsburgh basis" were eliminated and slight advances were allowed men working on certain gages in tin mills. Prevailing sheet and tin plate mill wage scales are 11 and 6 per cent, respectively, below scales adopted a year ago. Those scales, it will be recalled by readers of *The Iron Trade Review*, were revised at a third referendum several months ago.

The prevailing bar iron mill scale for the year 1914-15, without any changes, was adopted for the year beginning July 1. Puddlers will receive $5.50 on a 1-cent bar iron card which provides advances in wages for every $0.05 advance in bar iron sales averages.

Iron Workers on Strike

A general strike of inside ironworkers in Greater New York was declared on June 21 by the Inside Ironworkers Union. The strike leaders claim 125 shops have been affected, involving 2,500 workmen, and this number will be increased considerably during the next few days. The strikers demand a 48-hour working week, a minimum scale of $16 weekly for helpers and $22 for finishers and certain other conditions.

Money and Iron: Fact and Comment

President of American Car & Foundry Co. is Hopeful—Shipbuilding Likely to Continue Active for an Indefinite Period

An encouraging view of the outlook for better buying of equipment by the railroads is presented by President Frederick H. Eaton, of the American Car & Foundry Co., in his annual report to the stockholders. Mr. Eaton also refers to the changed conditions surrounding foreign equipment trade and the brighter prospect for the builders of this country to obtain a larger portion of this than in the past.

"It is doubtful whether the railroads have ever, in any year, bought less in comparison with their requirements than they have during the fiscal year just ended," he says. "This has been caused by no lack of desire on their part, and by no failure of theirs to recognize the need, if not immediately, at least in the near future, of additional equipment. The condition exists because of lack of financial ability to change it; but encouragement is to be found in the fact that an amelioration of this condition is indicated by tendencies now apparent.

Believes Conditions Improving

"It is difficult to believe that the unpropitious conditions surrounding the close of the fiscal year can long continue. There are some indications of improvement in railroad conditions. The roads have yet to feel the full benefit of the increase in rates granted them during the past year. At this writing the outlook for the crops throughout the country is good. While there are now many idle cars, it nevertheless is the fact that a return to normal conditions will make it apparent that new and additional equipment is essential to move the traffic of the country.

"The railroads of many of the new countries have been financed largely, if not mainly, by several of the European nations now at war. Such financing has in great measure given control of the business of supplying equipment as needed. This, for one reason, has made difficult the entry of American concerns into the field of foreign effort. Our exclusion from full participation in that field has not been due to any lack of ability to satisfy requirements, but to the financial control referred to. It seems reasonable to suppose that in the rearrangement of industrial conditions that must inevitably follow the great struggle now waging there will be afforded outlets for American products that have heretofore been closed to them."

The income account compares as follows:

	1915.	1914.
Net earnings	$3,615,054	$5,810,888
*Renewals	1,284,118	2,052,918
Bal. avail. for divs.	2,330,936	3,757,970
Preferred dividends	2,100,000	2,100,000
Balance	$230,936	$1,657,970
Common dividend	†600,000	600,000
Surplus	$80,936	$1,057,970
Main. and imp.	.....	700,000
Surplus	$80,936	$357,971
Prev. surplus	25,613,140	25,255,169
Total surplus	$25,694,076	$25,613,140

*Renewals, replacements, repairs, new patterns, flasks, extraordinary improvement, etc.
†Less $450,000 paid from reserve previously made for that purpose.

Owing to the death of two of the 15 directors during the fiscal year, the board was reduced to 13 and the retiring members were re-elected.

Files Statement

The Lorain Steel Co., incorporated under Pennsylvania laws, has filed with the Massachusetts secretary of state a statement of its financial condition, dated June 1, 1915, which compares as follows:

Assets:	1915.	1914.
Real estate and mach.	$3,255,655	$3,053,234
Material, stk. in proc.	675,848	813,489
Cash and debts receiv.	4,426,569	3,326,752
Total	$8,358,072	$7,193,476
Liabilities:		
Capital stock	3,000,000	3,000,000
Accts. payable	421,249	123,572
Funded debt	.....	5,000
Reserve funds	327,266	.....
Profit and loss	4,609,557	4,064,903
Total	$8,358,072	$7,193,476

Discusses Ship Building

The unprecedented activity in shipbuilding along the Atlantic coast is discussed by President Henry S. Grove, of the William Cramp & Sons Ship & Engine Building Co., Philadelphia, in his annual report to the stockholders. Mr. Grove says:

"At the present time there is great activity in the construction of vessels in the ship yards located along the Atlantic coast. These are largely cargo-carrying ships. There is every reason to believe that this activity will continue until the present disturbance on the continent reaches a settlement, and probably, owing to conditions in foreign yards, to a considerable period thereafter.

"The situation referred to in our annual report of 1913, as regards the necessity of spending a considerable sum of money to enable the plant to build economically the large ships required, still continues; and plans are under consideration for dealing with this situation."

During the year the company anticipated the payment of the remainder of the three-year six per cent notes and has cancelled the entire issue of $1,200,000, due April 1, 1916. The income account of the year shows:

	1913.	1912.
*Net profits	$561,795	$473,021
Fixed charges	255,119	264,913
Surplus for year	$306,676	$208,107
	1915.	1914.
*Net profits	$956,796	$1,180,332
Fixed charges	305,162	332,854
Surplus for year	$651,634	$847,477

*Insurance and taxes deducted.

The officers elected for the ensuing year are as follows: President, Henry S. Grove; vice president and general manager, Harry W. Hand; secretary and treasurer, Charles T. Taylor; assistant secretary, Richard L. How; assistant treasurer, George H. Carey.

Explains Adverse Trade Conditions

President L. R. Lemoine, of the United States Cast Iron Pipe & Foundry Co., in his report, referred to briefly in *The Iron Trade Review* last week, says:

"Your company's business throughout the fiscal year just ended continued to meet adverse conditions. In the first two months some little change for the better was apparent with respect to some of the discouraging factors referred to in the report last year, and there was some evidence of returning confidence. Then an unlooked-for event suddenly shook the world, accentuating the trying conditions with which you have been contending, and for a time resulting in the collapse of all financial markets, with nearly complete trade prostration in America. Necessarily, cautious curtailment of your company's business followed, and for several months nearly all your active plants were operated at a much reduced output. Chiefly because of the tonnage booked during the late spring and early summer months last year, that is, prior to the outbreak of the European war, there was a moderate gain in earnings over the corresponding period of the year previous and

even up to the winter months. On the other hand, the business paralysis referred to eventually forced your company to meet unprecedented conditions and pass through a period marked by a dearth of new business with prices at the lowest level touched in many years. Toward the close of your fiscal year, however, there was some improvement, and while the net gain for the fiscal year is not large, it distinctly reverses the final result shown a year ago; and this result is better than seemed possible until recently, so that your board hopefully regards the future."

Industrial Stocks

Discussion as to the credit of nations now at war and of methods of solving financial problems which confront these nations continued last week and probably had some effect on the market, which was rather inactive. The volume of business transacted was not large and interest centered chiefly in United States Rubber and other stocks not connected in any way with the iron business. Some attention was given Monday to the decision in the Lackawanna case, but Wall street was not much perturbed by it, as it has seen other separations and "dissolutions" carried on without disaster.

Following the announcement Wednesday of the $50,000,000 loan to French bankers, exchange on Paris did the unexpected thing by declining to the lowest point in modern times. Checks on Paris sold at 5.49 francs for a dollar, compared with a par of 5.18¼. It is evident that the Morgan loan is only a beginning and that similar transactions will follow, not only with France, but with Great Britain. It was announced Thursday that imports of gold from Canada had been resumed with the shipment of $2,500,000. The decline of United States Rubber received considerable attention. There was not much life to the market Friday. Transactions Saturday were also limited, but there was some showing of strength, except that United States Rubber and a few other stocks declined, the last decline of Rubber bringing it more than 14 points under the week's opening, owing to the persistent report that the dividend will be cut or passed. Rubber was one of the stocks which went soaring some time ago, with other so-called war stocks.

Quotations at the close of business June 26 and changes in the leading stocks identified with the iron and steel industry for the week are shown in the following table:

	Close June 26.	Net change.
Amer. Brake Shoe & Fdy. Co., ctfs.	103	+3
Amer. Brake Shoe & Fdy. Co., ctfs., prfd.	157½	+9
American Can	45½	+ ⅜
American Can, prfd.	100½	—1⅜
Amer. Car & Foundry Co.	55¾	+ ⅜
Amer. Car & Fdry. Co., prfd.	113	—1
American Locomotive	51¾	.....
American Locomotive, prfd.	97	+1
American Steel Foundries	40	+2⅛
Baldwin Locomotive	67½	+1⅛
Baldwin Locomotive, prfd.	102½	—1
Bethlehem Steel	170½	+7¼
Bethlehem Steel, prfd.	.....	.....
Colorado Fuel & Iron	32⅜	.....
Continental Can	68	.....
Continental Can, prfd.	99	+ ¾
General Electric	171	—1¼
International Harv. of N. J.	102	—2
Inter. Harv. Corp.	63½	+1
Inter. Harv. Corp., prfd.	....	.....
Nat'l Enamel'g & Stamp. Co.	18⅛	+1⅜
Nat'l Enam. & Stp. Co., prfd.	85	+3¼
Pressed Steel Car	49¼	+ ¼
Pressed Steel Car, prfd.	98⅛	+1⅛
Pullman Palace Car	160	— ¼
Republic Iron & Steel Co.	29¾	+ ¼
Republic Iron & Steel Co., prf.	88¼	+ ¼
U. S. Cast Iron Pipe & Fdy.	14	+ ⅛
U. S. C. I. Pipe & Fdy., prfd.	40	— ⅛
United States Steel	61⅛	+ ⅜
United States Steel, prfd.	109½	— ½
Westinghouse Mfg.	100¼	+2⅞

May Resume Dividends

Toronto, June 28. — At the annual meeting of the shareholders of the Dominion Steel Corporation in Montreal, June 24, President J. H. Plummer stated that he was hopeful that the company would be able to resume the payment of preferred dividends before long. The company was able to secure as much foreign business as it desired. The output of ingots had risen to 29,000 tons per month and another blast furnace would be started during the early part of July. Foreign demand for other products was equally favorable, and the company was also manufacturing a large amount of steel used in Canada for making shells. Since the war broke out, a benzol plant had been erected and had proved successful, and the profits from the manufacture of Foluol would pay for the expenditure on the plant. The president looked for a continuance of the demand from French and Belgian buyers after the war, as they were not likely to purchase from the German firms which had been the company's most formidable competitors. No improvement was noticeable in Canadian business, such demand as existed being for a few lines of small products.

Clears the Skies

By F. F. Beall,

Vice President of Manufacturing, Packard Motor Car Co., Detroit, Mich.

The decision of the United States supreme court in the case of the United States Steel Corporation has been looked forward to with much apprehension on the part of business men generally. The decision as rendered clears the skies to business.

The decision is looked upon as being just and fair to large combinations of capital, and if it reflects the attitude of the government, it will encourage the investment of capital in business.

Stockholders of the Rogers-Brown Iron Co., in a special meeting at Buffalo, approved the proposed increase in the capital from $6,000,000 to $7,000,000

Much Pleased

Is Chattanooga By Decision of Interstate Commerce Commission

The city of Chattanooga is greatly pleased by the decision of the interstate commerce commission in the case of the Chattanooga Packet Co. against the Illinois Central and other railroads. The decision recognizes Chattanooga as a river port and provides that it shall receive treatment as such at the hands of the railroads. The city has been subject to freight rates which in competition with other southern cities put it under a serious handicap which has now been removed, contingent on operation of packets or other adequate river service on the Tennessee and Ohio rivers, between Chattanooga and Ohio river points. To meet the new conditions, the city commission and business organizations appealed to the legislature for authority to issue $100,000 in bonds, to be used in providing adequate wharf and terminal facilities. This was granted and it is expected the improvement will be completed in the fall.

Secretary O. L. Bunn, of the Chattanooga Manufacturers' Association, says that an illustration of the benefit of the new ruling is shown by the fact that the first class rate from Chicago to Chattanooga, all rail, is $1.05, while the new rail and water rate will be 77 cents. He says that about 55,000 tons of steel bars, steel plates and other iron and steel products are used in Chattanooga in a year and that the reduction in the cost of freight will be about $2 per ton. Business men of Chattanooga believe that the city, with its natural advantages and the reduced rates, will become a more important center for the manufacture of iron and other products.

Pressed Metal Radiator Co., Pittsburgh, Pa., has removed its Chicago office from 311 Peoples Gas building to 11 South La Salle street, to obtain larger quarters. The office is in charge of Homer R. Linn.

Foundrymen Plan Interesting Week

Partial List of Papers to be Presented Before The American Foundrymens' Association, Sept. 25-Oct. 1—Institute of Metals Meets Simultaneously

FOUNDERS' week, the great annual event of American manufacturers of castings, will be celebrated this year at Atlantic City, during the week of Sept. 27. The occasion will be marked by the annual meetings of the American Foundrymen's Association and the American Institute of Metals as well as the yearly exhibit of foundry supplies and equipment conducted under the auspices of the Foundry & Machine Exhibition Co. Heretofore the Associated Foundry Foremen have held their meetings during this week, but since this organization has dissolved and its members have become affiliated as associates with the American Foundrymen's Association, they will take part in the deliberations of the latter society.

The program of the American Foundrymen's Association, while yet incomplete, already has assumed large proportions and to permit of full discussion of the many valuable papers that will be presented, two simultaneous sessions on malleable and steel castings will be held. The business meeting, which heretofore followed the close of the technical deliberations, will be held on Wednesday evening, Sept. 29, when the new officers will be elected and the business affairs of the association will be discussed.

An exceedingly gratifying increase in membership has been recorded during the year, the enrollment now approximating 1,000, of which more than 150 are associates. The campaign for new members resulted in the addition of nearly 100 new names and at the annual meeting it is believed a still further growth will be reported. Financially the society is in better condition than at any time in its history, and the balance in the treasury will permit of increasing the scope of the work that is now being carried on.

A partial list of papers that will be presented, follows:

"Resume of Advances in Foundry Practice", by Richard Moldenke.
"Application of Various Types of Molding Machines to Different Classes of Work", by J. J. Wilson and A. O. Backert.
"Time Studies on Molding Machines", by H. K. Hathaway, Philadelphia.
"Functions of Sand Binders" by H. M. Lane, Detroit.
"The Reclamation of Molding Sand", by W. M. Saunders and H. B. Hanley.
"Relation of the Foundry Foreman to the Manager", by S. V. Blair.
"Manufacture and Constitutents of Pig Iron and the Essentials in the Purchase of this Material", by O. J. Abell, Chicago.
"Pouring Systems for Gray Iron Shops", by H. Cole Estep.
"Fuel Oil Cupolas", by Bradley Stoughton, New York City.
"Thermal Reactions in Melting Gray Iron", by Dr. Joseph Richards, Lehigh, Pa.
"The Inspection of Automobile Castings", by C. B. Wilson, Pontiac, Mich.
"Defects in Gray Iron Castings and Remedies for Them", by Herbert Ramp, Cincinnati.
"The Value of the Vibratory Test in Steel Foundry Practice", by Lloyd Uhler, Pittsburgh.
"The Particular Application of the Converter in the Manufacture of Steel Castings", by C. S. Koch, McKeesport, Pa.
"Notes on Electric Furnace Construction and Operation in the Steel Foundry", by Mr. Gray, United States Steel Corporation, New York City.
"Correct Proportions and Essentials in Checker Design for Open Hearth Furnaces", by W. A. Janssen, Bettendorf, Ia.
"Causes for Shrinkage Cracks in Steel Castings", by William Bossinger, Marion, O.

In addition to the foregoing, reports will be presented by the committees on safety and sanitation, industrial education, costs, steel foundry standards, specifications for malleable castings, specifications for gray iron castings, specifications for steel castings and specifications for foundry scrap.

Aside from the many attractions afforded by Atlantic City, the entertainment features will involve a theatre party and banquet and a committee will be in charge of plant visitation, whose members will direct the visiting delegates to the many interesting foundries in Philadelphia and vicinity. It also is probable that numerous side trips will be arranged to enable visitors to inspect the shops in which they are interested, with the least amount of inconvenience.

Headquarters for the American Foundrymen's Association will be at the Marlborough-Blenheim hotel. The meetings will be held on Young's Steel Pier, where the registration booth also will be located.

C. E. Hoyt, secretary of the Foundry & Machine Exhibition Co., Lewis Institute, Chicago, reports that the space reservation already made, foreshadows one of the largest exhibitions ever held. Young's Steel Pier is admirably adapted for show purposes and all facilities are provided for the rapid erection and installation of machinery. The exhibition will be opened formally on Saturday, Sept. 25, and will close Friday, Oct. 1.

A. I. M. Program Notable

Arrangements are being completed for the annual meeting of the American Institute of Metals, which will be held in Atlantic City, Sept. 28 to Oct. 1. Headquarters will be established at the Hotel Traymore and a number of unusually important papers will be read and discussed.

Among the papers already arranged for are the following: "Albany Sand", by D. H. Newland, assistant state geologist, New York; "Experience with Brass in Civil Engineering Works", by A. D. Flinn, board of water supply, New York; "Molding Sand", by C. P. Karr, bureau of standards, Washington, D. C.; "Aluminum Die Casting Work", by Charles Pack, Doehler Die Casting Co., New York; "Cracking of Wrought Brass from Overstrain", by Dr. Burgess and Dr. Merica, bureau of standards; "Manufacture and Use of Alumino-Vanadium", by William W. Clark, Seymour Mfg. Co.; "Some Developments in Aluminum", by C. V. Powell, British Aluminum Co., Toronto, Ont.; "The Advantage of a Standard Railroad Bearing Alloy", by Russell R. Clarke, Pennsylvania Lines West; "Silicon Resistance Furnaces for Melting Brass", by Dr. Weintraub, General Electric Co., Schenectady, N. Y.; "Effect of Zinc on Copper, Tin and Lead Alloys", by G. H. Clamer, Ajax Metal Co., Philadelphia; "Copper-Aluminum Alloys", by W. M. Corse, Titanium Alloy Mfg. Co., Niagara Falls, N. Y.; "Forging Manganese Bronze", by Jesse L. Jones, Westinghouse Electric & Mfg. Co., Pittsburgh,; "Amorphous State of Metals", by S. L. Hoyt, University of Minnesota, Minneapolis, Minn.; "Method of Analysis for Complex Alloys" and "Development of Acid Resistance Alloys", by S. W. Parr, University of Illinois; "Metallographical Examination of 88-10-2 Alloy", by Dr. Rawdon, bureau of standards, Washington; "Electric Furnaces for Brass Melting", by F. A. J. FitzGerald, FitzGerald Laboratories; "Cobalt in Non-Ferrous Metals", by H. T. Kalmus, Kalmus, Comstock & Westcott, Inc.; "The Electric Furnace for Sherardizing", by Dr. S. Trood, U. S. Sherardizing Co.; "The effect of the Present European War on the Metal Industries", by Thomas F. Wettstein, United Lead Co.; "Stellite", by Elwood Haynes, Haynes Stellite Works, Koko-

mo, Ind., and "Analysis of Babbitt Metals", by Prof. D. J. Demarest, Ohio State University, Columbus, O.

Alters Constitution

The secretary of the American Institute of Metals announces that the proposed changes in the constitution have been adopted. As a result the annual dues will be increased from $5 to $10 per year. Also, a new form of membership, known as corporation membership, has been established for the benefit of concerns that wish to lend their financial support to the Institute, giving their various representatives a little lower rate per capita, when the number is three or more, than would be available by taking out straight individual memberships. The new arrangement also will enable foremen and other members who do not wish to secure the bound volume of the *Transactions* to obtain all the privileges of the meetings and to receive advance copies of the papers at the same rate as at the present time.

The secretary also has announced that the *Transactions* are becoming so large and comprehensive that it was deemed advisable to secure the services of an expert editor. Charles Vickers, Titanium Alloy Mfg. Co., Niagara Falls, N. Y., formerly associate editor of *The Foundry,* has been retained for this purpose and will edit volume VIII.

Death of Elmer Crawford

Elmer Crawford, president and founder of the Crawford Publishing Co., Chicago, and editor of *Mill Supplies,* passed away at the Hotel Sherman in that city on Tuesday, June 15.

Mr. Crawford was born in Michigan, May 1, 1862. In 1879 he moved with his parents to Ann Arbor. He graduated from the literary department of the University of Michigan, in 1884, and from the law department in 1886, and later was admitted to the bar of his home state. He practiced law successfully in Detroit for several years. He then became interested in trade journal work. In 1910, he established the Crawford Publishing Co. and became its president and editor of *Mill Supplies,* the company's principal publication. He was a profound believer in trade associations as educational factors, and was ever active in promoting their interests. He was present at the birth of the American Supply and Machinery Manufacturers' Association, in Savannah, 10 years ago, and later assisted in the organization of the National Supply and Machinery Dealers' Association. He was also present when the National Supply and Machinery Dealers' Association was established a few years ago.

Resentment

Is Felt in Canada on Account of Complaints of Lord Curzon

Toronto, June 29.—The statement by Lord Curzon in the British House of Lords that the delivery of shells by Canadian manufacturers had been exceptionally bad has excited a strong feeling of resentment among manufacturers and is regarded as unjust, considering all the conditions. The Canadian shell committee has published a reply stating that undertaking for the delivery of empty shells has been thoroughly fulfilled. The British government, however, has notified the shell committee that future deliveries must be of fixed ammunition and that empty shells are no longer required. This involved the purchase of machinery and the establishment of the necessary organization. It can readily be understood that the capacity to produce empty shells in Canada far exceeds the capacity of the organization only recently established to convert them into fixed ammunition. Complete shells are now going forward in small quantities.

Frederic Nicholls, of the Canadian General Electric and Canadian Allis-Chalmers companies, Toronto, characterized Lord Curzon's statement as being about as unfair as it could be made. He said that the first order was for 200,000 shells only, which, when divided up among a number of manufacturers, made the quantity allotted to each so ridiculously small that no serious investment in suitable machinery was warranted. It was only lately that orders in reasonable quantities were offered to the shell committee, and at that late date it was difficult to secure the machines required, as the American manufacturers had cornered all the available machinery in the market. In October, last, he had communicated with the British war office, offering to invest two or three million dollars in a manufacturing plant for quick production, provided an order were given for 1,000,000 shells, but was then advised that no further supplies of ammunition were required. Other corporations would have done likewise, had they received encouragement, and it was only within the last few weeks that orders for further production had been received, and even then only in moderate quantities.

G. R. Barnes, M. P., the British commissioner now visiting Canada to obtain skilled mechanics to manufacture war munitions, who is now in the west, where he has visited the principal industrial centers, says that he does not expect to be able to secure more than 2,500 men. Four representatives of the British war office, A. W. J. Haigh, of the British board of trade; D. W. Bremner, of Woolwich arsenal; H. C. Sitters and E. W. Bull, of the admiralty, have arrived in Toronto to test the fitness of the applicants, who are being examined in groups. The first lot accepted, numbering 30, left this week for England.

The Canadian Car & Foundry Co., Montreal, has received an order from the Canadian government, amounting to $750,000, for 600 standard 40-ton freight vans for the government railways.

The National Steel Car Co., of Hamilton, Ont., has received an order for 1,300 railway cars for the French Nord line, amounting to $1,250,000.

Owing to the rapid growth of the Ontario Hydro-Electric system, the available power from Niagara Falls under the present contract will soon be exhausted. The total consumption of power under control of the hydro-electric commission at the end of April amounted to 88,000-horsepower, of which Niagara contributed 75,281. The contract with the Ontario Power Co. calls for a maximum amount of 100,000-horsepower, and the commission has notified the company that this will shortly be required. Extensive plans for the development of new power are being prepared by the commission for submission to the Ontario government. It is understood that these plans will provide for an ultimate development of 250,000-horsepower, to be mainly derived from developments on the Welland canal and new publicly-owned plants on the Niagara river, though other projects are being considered.

A large number of residents of Martins Ferry, O., last week declared they would oppose any attempt of insurgent members of the Amalgamated Association to interfere with employes at the plant of the Whitaker-Glessner Co., which resumed operations 10 days ago. It is not improbable committees will be appointed to protect workmen going to and from the plant. Members of the United Association of Iron and Steel Workers who seceded from the Amalgamated Association are accused of interfering with mill employes.

The Greenwich Coal & Coke Co., Johnstown, has transferred 161 acres of coal in Green township, Indiana county, Pennsylvania, to the Manor Real Estate & Trust Co., a subsidiary of the Pennsylvania Railroad, for $12,575.

Would Utilize Plants for Munitions

Makers Are Disappointed, Due to Lack of Equipment for Early Delivery—Domestic Demand Takes Slump in Chicago

THE MACHINERY market again is excited by heavy demand for lathes and other equipment for the manufacture of war munitions. Concerns all over the country are investigating the possibility of utilizing their plants for the manufacture of shrapnel and high explosive shells, and are meeting with much disappointment, due to the impossibility of getting the necessary equipment for early delivery. This arises from the fact that all manufacturers of machinery of this character are booked ahead for several months, while, in some cases, they have sold part of their next year's production. Actual buying, therefore, is in much smaller volume than would be the case were the machinery dealers and manufacturers able to supply the demand. One of the biggest buyers in the east, during the past week, has been the American Locomotive Co., which closed on a large quantity of additional equipment to manufacture war materials. Another large buyer recently was the American Machine & Foundry Co., Brooklyn, which also is to engage in the manufacture of war munitions. Other eastern buyers were the Snead & Co. Iron Works, Jersey City, N. J., and the A. P. Smith Mfg. Co., East Orange, N. J., which bought liberally of lathes and other equipment to make shrapnel. Among concerns figuring on war contracts are the American Brake Shoe & Foundry Co., which is inquiring on a large amount of equipment for making shells; the Scullin-Gallagher Iron & Steel Co., St. Louis, and the E. J. Codd Co., Baltimore. The latter is figuring on a large amount of equipment for making high explosive shells. The American Steel Foundries continues to figure on machinery for making war materials. The Columbia Machine Works & Malleable Iron Co., Brooklyn, is understood to have booked a large contract for 3-inch shrapnel. This company is endeavoring to purchase about 125 turret and engine lathes and screw machines, some 15 grinders, about 10 drawing presses and other equipment. The Carpenter Steel Co., Reading Pa., is understood to have booked a large shell contract. The J. L. Mott Co., Trenton, N. J., has booked a big order for time fuses. In addition to the active domestic demand, the foreign demand is of large proportions. Heavy inquiries continue to come from Russia, England and France, and there also are good-sized inquiries from Italy and, to a smaller extent, from Sweden. Only a small portion of this demand is being filled owing to the sold-up condition prevailing on the machines most in demand.

Domestic demand for machine tools continues to maintain the improvement of past weeks, but the volume of business originating from other than war sources is by no means near the normal. The crane market reflects a distinct improvement and some makers say there now are more inquiries out than at any time within the year. The Cleveland Crane & Engineering Co., Wickliffe, O., has booked several large contracts, including one 35 and one 20-ton cranes for the Bollinger-Andrews Co., Pittsburgh, one 15 and one 60-ton cranes for the Erie plant of the General Electric Co. and eight cranes for the Warren Tank & Boiler Co., Warren, O. Day & Zimmerman, Philadelphia, have purchased a five-ton Sheppard crane for the new plant of the W. O. Hickock Co., Harrisburg, Pa. The Ferracute Machine Co., Bridgeton, N. J., has ordered a 10-ton Pawling & Harnischfeger crane. The Pawling & Harnischfeger Co. also has booked 15 dock cranes of special design for the city of New Orleans. The Morgan Engineering Co., Alliance, O., has booked some large orders for export to Russia. Among eastern concerns who are extending their capacity are the Pierce-Arrow Motor Co., Buffalo; the Sperry Gyroscope Co., Brooklyn; the Hartford Special Machinery Co., the Jacobs Mfg. Co. and the Bryant & Chapman Co., Hartford, Conn.; the American Chain Co. and the Whipple & Choate Co., Bridgeport, Conn.; the Ansonia Brass & Copper Co., Ansonia, Conn.; the Norton Co., Worcester, Mass.; American Fork & Hoe Co., Binghampton, N. Y.; Inman Foundry Co. and Ed. L. Smith Foundry Co., Amsterdam, N. Y.; Mercer Auto Co., Trenton, N. J.; Fleetwood Metal Body Works, Fleetwood, Pa.; Bouney Vice & Tool Co., Allentown, Pa., and numerous others.

Enter Second Half with Many Orders

MACHINE tool dealers in the Pittsburgh district are entering the second half of the year with more orders on their books than they have carried at any time in many years. Some dealers say contracts booked the last 60 days exceed those taken during all the preceding 18 months. The Westinghouse Electric & Mfg. Co. and other Westinghouse interests, all of which are making war material, continue to buy lathes for installation in plants in this and adjacent territory. Subsidiary companies of the United States Steel Corporation are asking estimates on miscellaneous types of machinery, and the Carnegie Steel Co. has sent out definite inquiries for additional punches and straightening equipment. The Allegheny Steel Co., Brackenridge, Pa., is figuring on a 10-ton crane for installation in the plate department. The Youngstown Sheet & Tube Co. continues to buy equipment for its proposed bar mill department. Builders of heavy rolling mill machinery are enjoying fairly active conditions. It is understood an attractive order for rolling mill machinery for export recently was placed, but details are not known.

Mysterious Company in Chicago Arouses Interest

MUCH INTEREST and speculation have resulted from a rumor persistently current of the formation of a company, which is not to be incorporated, for the purpose of making war supplies in Chicago. Great secrecy is observed and it is said such contracts for equipment as have been let are under seal of absolute silence. The rumor states the company has leased two or more idle plants in the city of Chicago and has contracted for about $500,000 worth of machine tools and is willing to wait their delivery in regular order late in the year. This indicates absolute confidence in the war's continuing many months longer.

Domestic demand for machine tools is not holding as well as it started a few weeks ago, prices apparently being too high and delivery too much deferred. Demand from Canadian buyers continues strong and standing orders for various lines are in the hands

A recent installation of our Wood Blocks in the plant of the Commonwealth Steel Company, Granite City, Ill.

Users Know Best

WHEN you wish to obtain correct information regarding the practicability and true value of a product, the place to go is direct to the users of that product. *Users* will eliminate all theory. They will place before you nothing but the cold, hard facts in the case. Good features will be endorsed; defects will be revealed.

The first sale of

Ayer & Lord Interior Wood Blocks

was the hardest that we have had to make. Since then our sales have been getting easier and easier, until now we have reached the point where our blocks practically sell themselves.

This is because "*users know best,*" and what they have to say about **Ayer & Lord Interior Wood Blocks** leaves no room for argument.

Following Are the Opinions of a Few Users:

"We are glad to state that your wood paving blocks, after all other materials have proven a failure, are very satisfactory."

"Around our plant we have never had any flooring of any kind that has stood trucking so well."

"We highly recommend it for rolling mills or other factories where heavy weights are moved by trucks."

"We have three of your wood block floors in our shops and they prove very satisfactory indeed."

The excellent service given by *Ayer & Lord Interior Wood Blocks* in other plants resulted in our being able to present to you the above illustration. This company produces large car truck frames. The huge steel castings and the extensive trucking would soon have proved disastrous to any other kind of flooring.

Write for our little booklet—
"FLOORS"

Ayer & Lord Tie Company

General Office: Railway Exchange, Chicago

CLEVELAND, OHIO
926 Illuminating Building

KANSAS CITY, MO.
1117 Rialto Building

MEMPHIS, Tenn.
1402 Exchange Building

PHILADELPHIA, PA.
319 Perry Building

of almost all dealers. Buying of new machinery from makers by dealers is a matter of uncertainty, as the latter do not know whether conditions warrant their placing contracts at present prices for delivery so far into the future. Fear is expressed that a cessation of buying in Europe would leave the dealers with high-priced material on their hands.

Heavy contracts have been placed in Chicago recently for war munitions and this has put much equipment into service that formerly was idle and has made much more difficult the task of the dealer seeking second-hand machines to supply outside demand. The Italian government is said to be seeking 100 lathes and also to place an order for several million shells. Some dealers who have ordered new machines from manufacturers each month since the increased foreign business developed are obtaining deliveries steadily and are able to supply more or less of the demand for new machinery.

Foreign Inquiries Have But Little Show in Cincinnati

AN INQUIRY for 200 lathes from Italy and one for more than 1,000 lathes and milling machines from France, have been withdrawn from the Cincinnati market because of the lack of bids. The deliveries specified could not be met, as most of the makers have sufficient orders to run at full capacity for several months. The much talked of rumor that plants in Dayton, O., are offering abnormal wages in order to induce skilled mechanics to come to that city, has proved to be without foundation. In some cases special wages may have been offered for special work, but the general level of wages in Dayton is about the same as that in Cincinnati.

EASTERN STATES

PORTLAND, ME.—Lion Tractor Co., Inc., has been incorporated; $1,000,000 capital stock; by Eben Winthrop Freeman, Charles M. Drummon, E. M. Wall and Henry A. Peabody.

WATERVILLE, ME.—B. D. McLellan Co., machinery, has been incorporated; $50,000 capital stock; by B. D. McLellan, M. F. Lovejoy and Laura P. McLellan.

LACONIA, N. H.—Laconia Car Co. has taken a contract to furnish 250,000 explosive shells for the Russian government, which is said to involve about $5,000,000.

BRATTLEBRO, VT.—Ames Hill Corporation has been incorporated for manufacturing purposes; $25,000 capital stock; by Gustaf Stromberg, New York; Clarke C. Fitts and Harold E. Whitney.

BURLINGTON, VT.—Burlington Evaporator Co., recently incorporated with $15,000 capital, is locating a plant in Burlington for the manufacture of maple sugar evaporators, etc.

BARROWSVILLE, MASS.—Defiance Mfg. Co. has been incorporated; $800,000 capital stock; by E. M. Churchill, Norman J. MacGaffin and Albert A. Richards.

BOSTON.—General Radio Co. has been incorporated; $30,000 capital stock; by J. Porter Russell and William A. Kneeland.

BOSTON.—Sturtevant Mill Co., 11 Brook street, Dorchester, has been granted a permit for erecting a concrete building.

BOSTON.—Revere Rubber Co., 200 Devonshire street, has started work on a 2-story addition to its plant in Chelsea.

BOSTON.—Architects Stebbins & Watkins, 164 Federal street, are taking revised bids on a 1 and 2-story and basement, 65 x 131-foot light manufacturing building, to be erected for W. F. Smith.

BOSTON.—Elberfield Chemical & Mfg. Co. has been incorporated to do business in Sandwich; $50,000 capital stock; by Frank A. Nauffton, Sanford E. Morse and Simeon Morse.

CHICOPEE, MASS.—Bosch Magneto Co. is having new plans prepared for the proposed $70,000, 170 x 250-foot, 2-story, steel brick addition to its plant, previous bids being too high. A. R. Klein is the engineer in charge.

LEOMINSTER, MASS.—Wellington Piano Case Co. is considering a large contract for gun stocks, for which, if the deal goes through, $20,000 to $30,000 machinery will be purchased.

LOWELL, MASS.—Wamesit Powder Co. has begun work on a 2-story, 60 x 350-foot ammunition factory.

LYNN, MASS.—Aurora Electrical Co. recently incorporated with $120,000 capital, is getting ready to erect a new plant on Western avenue. The company will manufacture spark plugs and other products.

MEDFORD, MASS.—Fuller Electrical Appliance Co. has been incorporated; $50,000 capital stock by Louis D. H. Fuller, Frank A. McClaskey and Michael F. Mahone.

NEW BEDFORD, MASS.—Mt. Pleasant Iron Foundry, Inc., has been incorporated; $8,800 capital stock; by William Sloane, William Wignall and Benjamin Allmond.

SPRINGFIELD, MASS.—Standard Electric Time Co., 89 Logan street, has begun work on an extension to its office building.

WORCESTER, MASS.—A. G. Hildreth, 25 Herman street, will add a 3-story, 50 x 60-foot extension to his factory building on Herman street.

WORCESTER, MASS.—M. Thos. O'Leary, president, treasurer and general manager of the L. W. Pond Machine & Foundry Co., is reported to have bought out other holdings in the company and to have plans for practically doubling the capacity of the plant.

BANTAM, CONN.—Bantam Anti-Friction Co. has let the contract for a 3-story addition, 67 x 89 feet.

BRIDGEPORT, CONN.—American Chain Co. has let contracts for two additions.

BRIDGEPORT, CONN.—Whipple & Choate Co. has begun work on a 1-story addition, 57 x 70-feet.

BRIDGEPORT, CONN. — Lake Torpedo Boat Co. has acquired 17 acres adjacent to its plant and will improve this for the erection of buildings which will double its capacity.

BRIDGEPORT, CONN. — American & British Mfg. Co. is reported to have received an order for projectiles to be supplied to Italy. The order, it is said, involves $17,000,000.

BRIDGEPORT, CONN.—Crane Co. states the report that it has decided to enter into the manufacture of shrapnel and has equipped a portion of its West End plant for that purpose is entirely without foundation. General Manager Bennett states the company has no intention of taking on any contracts for war material, nor has it at any time seriously considered doing so.

DANBURY, CONN.—Heim Machine Co., which has commenced work on a 2-story frame addition, has plans for a larger permanent structure which will be erected later.

HARTFORD, CONN. — Hartford Special Machinery Co. has completed a new 1-story factory, 55 x 320-feet.

HARTFORD, CONN.—Bryant & Chapman Co. will build a 1-story, 54 x 138-foot extension.

NEW HAVEN, CONN.—Winchester Repeating Arms Co. has been granted permit for erection of 1-story addition to its hydraulic plant. The new building will be 73 x 455 feet.

SOUTHINGTON, CONN. — Contract has been let for an addition to the Southington Mfg. Co.'s plant.

SOUTHINGTON, CONN. — Atwater Mfg. Co. is having plans drawn for a large addition to its plant at Milldale, which will be used for a forging department.

STAMFORD, CONN.—Remington Oil Engine Co. has increased its capital stock from $125,000 to $200,000.

ALBANY, N. Y.—Biggi-Mayersohn Co., engineering, construction, has been incorporated; $10,000 capital stock; by Louis Mayersohn, Mary A. and Frederick A. Biggi, 11 Manolia Terrace.

AMSTERDAM, N. Y.—Ed. L. Smith Foundry Co. has begun work on the erection of a new building, 1-story, 40 x 70 feet.

AMSTERDAM, N. Y.—Inman Foundry Co. is starting work on a 2-story, 40 x 60-foot building.

BINGHAMTON, N. Y.—American Fork & Hoe Co. has begun work on a 2-story, 70 x 70-foot building.

BINGHAMTON, N. Y.—Ballard Silk Co. has let contract for a 1-story, 35 x 111-foot addition.

BROOKLYN.—American Machine & Foundry Co. has placed orders for a large amount of equipment for making shells and still is in the market.

BROOKLYN.—J. M. Huber, 65 West Houston street, New York has let contract for an addition to his factory building at 618-32 Sixty-second street, Brooklyn.

BROOKLYN.—Columbia Machine Works & Malleable Iron Co., 69 Chestnut street, is reported to have booked a 3-inch shrapnel contract. This company is inquiring on about 125 turret and engine lathes and screw machines, some 15 girders and about 10 drawing presses. The company is considering plans for erecting additional buildings.

BUFFALO.—Rogers-Brown Iron Co. has increased its capital stock from $6,000,000 to $7,000,000.

BUFFALO.—Pierce-Arrow Motor Co. has let contract for a $200,000 addition to its plant on Elmwood avenue. Work is about to be started.

HEMPSTEAD, N. Y.—Nassau & Suffolk Lighting Co. has increased its capital stock from $500,000 to $1,500,000.

HERKIMER, N. Y.—Royal Gem Mills will build an addition.

LONG ISLAND CITY, N. Y. — Seubert Bearing Co. has located at 556 Jackson avenue to manufacture ball bearings. The company has purchased a considerable quantity of machinery.

NEW YORK.—Geo. W. Grote & Co., 430 East 102nd street, manufacturers of paint, have purchased 5-story building at 502 to

506 East Seventy-fourth street, and will occupy this building shortly, as an auxiliary to the present plant.

NEW YORK.—American Brake Shoe & Foundry Co. is inquiring on a large amount of equipment for making shells.

NEW YORK. — Engineers Twombley & Henney, 55 Liberty street, shortly will complete plans for a 1-story lighting plant to be erected at Ocala, Fla., at a cost of $75,000.

NEW YORK.—American Can Co. has let contracts for the erection of a new can factory at Kansas City. The new structure will be five stories and will cost approximately $500,000.

ROCHESTER, N. Y.—Bausch & Lomb Optical Co. let contract for a 1-story, 80 x 200-foot glass grinding shop.

ROCHESTER, N. Y.—Rochester Connecting Railroad Corporation has been incorporated: $200,000 capital stock; by Alex J. Porter, Albert H. Merritt and Frank A. Dudley, 45 Falls street, Niagara Falls.

SYRACUSE, N. Y.—Merrill-Soule Co. has let contract for a 2-story, 56 x 123-foot machine shop.

UTICA, N. Y.—Macks Machine Co. has been incorporated; $5,000 capital stock; by Anthony J. Kieffer, Patrick J. McElligott and Francis W. Stedman, 1403 West street, Utica.

ALLENTOWN, PA.—Bouney Vise & Tool Co., in which J. A. Durham Jr., is interested, will build a 1-story, 50 x 153-foot plant at Washington and Boundry streets. The architects are Jacoby & Weishampel, Commonwealth building.

CLEARFIELD, PA.—Snow Shoe Light, Heat & Power Co. has been incorporated; $5,000 capital stock; by Warren Partridge, W. O. Hoover and James P. O'Laughlin, Clearfield.

LEBANON, PA.—A. S. Kreider, Annville, Pa., contemplates building a three story factory here.

MARYSVILLE, PA. — Aluminum Co. of America, Pittsburgh, Pa., is to build a 40 x 50 foot, steel addition.

PHILADELPHIA.—Fire caused slight damage at the plant of August Vogel & Sons, sheet metal workers, 4820 Rising Sun lane.

PHILADELPHIA.—A. H. & F. H. Lippencott, Twenty-fourth and Locust streets, have let contract for a 4-story and basement, 110 x 170-foot factory to be erected at Twenty-fifth and Locust streets.

PHILADELPHIA. — Walter W. Gibbons, representative of C. W. Burton, Griffiths & Co., London, who is staying here temporarily at the Hotel Walton, is endeavoring to let contracts for the manufacture of high explosive shells for the British government.

PITTSBURGH.—Allegheny county will join with Westmoreland in building a bridge across the river from Natrona to Braeburn.

READING, PA.—Carpenter Steel Co. will erect an annealing building, 65 x 175 feet, to cost about $40,000.

READING, PA.—Plans have been completed by Wayne M. High, 11 North Fifth street, for a 2-story, 40 x 489-foot plant, to be erected at Fleetwood, for the Fleetwood Metal Body Works. Harry Urich, Fleetwood, is among those interested in the concern.

SOUTH BETHLEHEM, PA. — Bethlehem Steel Co. will begin work at once in construction of a new shell loading plant, 60 x 360 feet. The company also is building a machine shop and loading plant at its Saucon plant.

ELIZABETH, N. J.—The borough council at Kenilworth has granted permission to the American Locomotive Co. and the Westinghouse Electric & Mfg. Co. to erect a plant to be used jointly by the two concerns, it is reported, for the manufacture of cartridges.

HOBOKEN, N. J.—Architect E. W. Grauert, 36 East Twenty-third street, New York, is taking bids on the 12-story electrical appliance manufacturing building, to be erected at Park avenue and Boulevard, Weehawken, N. J., for J. H. Jaeger, 68 Hudson street, Hoboken.

JERSEY CITY, N. J.—Cartridge Machinery Co. has been incorporated; $10,000 capital stock; by John M. Ferry, George H. Makepeace and Edwin G. Peters, all of Jersey City.

MADISON, N. J.—Rockland Chemical Co. has been incorporated to manufacture heating appliances; $20,000 capital stock; by William F. Kenny, New York; J. A. McNamara, New York, and Edward J. O'Donnell, Madison.

TRENTON, N. J.—DeLaval Steam Turbine Co. has let contract for a 1-story, 80 x 120-foot power house.

TRENTON, N. J.—J. L. Mott Co. has booked a war contract involving $5,000,000 worth of time fuses.

TRENTON, N. J.—Mercer Auto Co. has commenced work on a 1-story, 60 x 400-foot addition.

BALTIMORE.—E. J. Codd Co. is figuring on a large amount of equipment for making high explosive shells.

BALTIMORE.—It is understood the Pennsylvania railroad will take bids shortly on a new pier and coal-handling plant to be erected at Canton, Md. The railroad has contemplated this project for about three years. The new pier is to be 942 feet long and 66 feet wide. It is expected to have capacity for loading 6,000 tons of coal in ten hours. The pier will be equipped with a thawing plant and will be provided with a yard capable of holding some 800 cars loaded and empty.

HAGERSTOWN, MD.—Architects Peuckert & Wunder, Philadelphia, have completed plans for the 1-story, 100 x 200-foot addition, to be erected here by the Pangborn Corporation.

Hints for Live Wire Sellers

These are times when competition is sharp; if you overlook these hints, you are giving the other fellow the advantage.

O. K. Cole and associates, who recently purchased the Ford & Donnelly foundry at Kokomo, Ind., advise they will remodel and greatly increase the capacity of the plant. Plans call for a new foundry, pattern shop, pattern warehouse and other improvements, including new equipment.

Federal Rotator Co., New Castle, Pa., will send out inquiries at an early date for a considerable amount of new equipment.

Moltrup Steel Products Co., Beaver Falls, Pa., will announce shortly definite plans for improvements and additions to its plant. The company manufactures cold drawn milled and ground specialties.

Columbia Machine Works & Malleable Iron Co., 69 Chestnut street, Brooklyn, is inquiring on about 125 turret and engine lathes and screw machines, some 15 grinders, about ten drawing presses and other equipment.

American Machine & Foundry Co., Brooklyn, still is in the market for equipment for manufacturing shells.

American Brake Shoe & Foundry, 30 Church street, New York, is in the market for a large amount of equipment for manufacturing shells.

E. J. Codd Co., Baltimore, is figuring on a large amount of equipment for manufacturing high explosive shells.

American Steel Foundries Co., Chicago, continues to inquire for shell-manufacturing equipment.

CENTRAL STATES

CANAL DOVER, O.—Mybro Heating & Ventilating Co. recently increased its capital stock from $1,000 to $60,000 for the purpose of manufacturing the Mybro furnace. The foundry work until recently has been done in Dennison, O., under contract.

CANTON, O.—Canton Electric Co. will issue $106,000 for the erection of a power plant and other extensions.

CLEVELAND.—Wellman Bronz Co. has increased its capital stock from $50,000 to $100,000.

CLEVELAND.—M. A. C. Tap & Tool Co. has been incorporated; $25,000 capital stock; by H. J. McGivern, F. T. Cullitan, W. W. Pliley, George Ebert and Philip Le Due.

CLEVELAND.—Cuyahoga Stamping & Machine Co. has been incorporated; $1,000 capital stock; by Paul G. Kassulker, G. N. Shaver, A. A. Stephens, Jesse Stephens and R. Kornfield.

CONNEAUT, O.—The city will spend $12,000 for repairs and equipment for the steam plant of the electric light plant, including two new boilers, a new smokestack, and three stokers. Ben Laubach is superintendent.

CUYAHOGA FALLS, O. — Falls Hollow Stay Bolt Co. is building a 50 x 150-foot addition to the plant of the Walsh Milling Co. and will occupy it with new machinery for rolling hollow bars, until the Walsh company is able to erect a permanent rolling mill at Prospect street and the B & O. railroad; about 200 men will be employed.

DAYTON, O.—C. C. Wilson has purchased a factory site on South Summit street, Edgemont, and will start a factory for the manufacture of gasoline or oil-driven agricultural implements.

DAYTON, O.—The city commissioners have plans under way for three bridges, as follows: Keowee street bridge, $70,000, bonds already floated; Fifth street bridge to cost $125,000, and the Webster street bridge to cost $100,000. Legal Director McConnaughey reports it is legal under the flood emergency measure to issue bonds for the two latter structures.

FREDERICKSBURG, O.—Citizens have subscribed $30,000 in stock in the Zorg Mfg. Co., and the plant will be doubled in size. Road-scrapers are the principle product of the company.

GIRARD, O.—Engineer William Wilson has submitted new plans for the proposed high level bridge to the board of trade for approval.

IRONTON, O.—Mr. Halley and associates will form a $1,000,000 company for the manufacture of limestone, brick and cement.

LEXINGTON, O.—The county commissioners will issue $17,000 bonds to replace bridge at Stringtown with a steel structure, creolite

floor, and to make other bridge and culvert repairs in the county.

MARIETTA, O. — Glaven Mfg. Co. has been incorporated with $25,000 capital stock by Fred M. Coskey, Florence H. Coskey, Florence C. Plumer, B. A. Plumer and G. H. Crawford. The company has taken over the plant of the Conductor Fitting Co. for the manufacture of galvanized spouting.

MARION, O.—Electors of Green Camp village will vote July 17 on a $5,000 bond issue for the installation of a lighting system.

MIDDLEFIELD, O.—Ohio Pail Co. has commenced work on the construction of a building, adding 3,000 square feet of floor space. Machinery for tin can making will be installed, to be ready Sept. 1.

RAVENNA, O.—Mohawk Motor Truck Co. has been incorporated; $25,000 capital stock; by S. O. Dougherty, E. M. Jones, E. W. Chapman, Herman Hill and W. E. Dougherty.

SALEM, O.—F. W. Harris, Coatesville, Pa., representing the Municipal Service Co., Philadelphia, announces the company will take over the Salem Light & Power Co. and the Columbia Light & Power Co. and the company shortly will spend $80,000 in improvements, etc. H. T. Hartman is the head of the Municipal Service Co.

WARREN, O.—W. R. Harrington, county auditor, will receive bids until July 12, for the erection of the substructure and superstructure of the Brown bridge, near Bloomfield; certified check for $100 required.

CHARLESTOWN, W. VA. — Continental Piston Ring Co., of Memphis, Tenn., has incorporated in West Virginia; $100,000 capital stock; by B. H. Mason, Ft. Worth, Tex.; W. P. McCadden, C. R. Bryant, S. W. Partlock, J. E. McCadden, Memphis, Tenn.

LEXINGTON, KY.—J. R. Soard, will erect a plant for the manufacture of cement, sewer pipe and similar specialties. The equipment now is being ordered.

LOUISVILLE, KY.—C. Lee Cook Mfg. Co., manufacturer of metallic packing for steam engines, has been incorporated, its capital stock being $50,000 and debt limit $100,000. C. Lee Cook and others are the incorporators.

LOUISVILLE, KY.—Ewald Iron Co. has been incorporated with $1,500,000 capital stock by B. Taylor Hickman, president, A. T. Hert, vice president and Lawrence Jones, chairman. These three control the stock and will continue the former Ewald Iron Co. The plant will be enlarged considerably.

MARY, KY.—C. L. Morris is planning the establishment of a plant to manufacture cotton oil and other cotton seed products and wants quotations on machinery and other information.

MT. STERLING, KY.—Interstate Land & Mining Co., incorporated in Mt. Sterling with $75,00 capital stock; will develope zinc and lead land in Missouri and Oklahoma; address H. Clay McKee.

EVANSVILLE, IND.—Rapid Barrel Opener Co. has been incorporated to manufacture barrel openers; $10,000 capital stock; by E. P. Hahn, H. B. Cook and S. F. Goodman.

HUNTINGBURG, IND.—Huntingburg Electric Light Co. has dissolved and turned the property over to the city.

INDIANAPOLIS. — International Machine Tool Co. is to build an addition to its plant at Twenty-first street and the Belt railroad at a cost of $15,000.

INDIANAPOLIS.—Traylor & Woolf Welding & Cutting Mfg. Co. has been incorporated; $10,000 capital stock; by M. H. Traylor and Marie A. Traylor, Burt L. Woolf.

INDIANAPOLIS.—Hulett-Law Mfg. Co. has been incorporated to manufacture and repair automobiles; $50,000 capital stock; by T. B. Hulett, R. V. Law and W. J. Welbourn.

INDIANAPOLIS.—Frederick W. Wallick, 103 Park avenue, New York City, and 1056 Lemcke Annex, Indianapolis, is making plans for a $400,000, four to 5-story coliseum building of brick and stone with steel frame for the Coliseum Hotel corporation, R. S. Fletcher, 316 North Meridian street, Indianapolis, manager.

JEFFERSONVILLE, IND.—Geo. Stoner, county auditor, will receive bids early in July on four steel reinforced concrete bridges, 30 to 90-foot spans; one 180-foot reinforced concrete span.

KOKOMO, IND.—Kokomo Spring Co. is asking for catalogs on wire working and spring forming machinery.

LAPORTE, IND.—Laporte county commissioners have agreed with the Porter county commissioners to construct 40-foot, steel span over the county line ditch, plans to be prepared by Enginer Miles of Laporte county.

RICHMOND, IND.—City soon will have reports from its engineer on the cost of the South Side bridge at E. street, which will be between $140,000 and $170,000.

RICHMOND, IND.—Richmond Adding & Listing Machine Co. has been incorporated to take over the Sweet Adding-Listing Machine Co.; $750,000 capital stock; by Fred D. Bethard, Curtis M. Wann, W. J. Bethard, Fletcher Johnson, et al.

CHICAGO.—American Steel Foundries continues to inquire for equipment for making shells.

CHICAGO.—F. N. Wilson, consulting mechanical engineer, 331 West Thirty-fifth street, desires to buy a second-hand double drum hoisting engine of 20 to 30 horsepower.

CHICAGO.—Bids will be received until July 8, by the department of public works for five water tube boilers and superheaters for Central Park avenue pumping station.

METROPOLIS, ILL. — Electric Automatic Pop Corn Machine Co. has been incorporated to manufacture a patented device; $15,000 capital stock; by John G. Kotter and E. E. Stephens.

QUINCY, ILL.—Noll Hauworth Co. has bought a site on which to build a 1-story factory 50 x 150 feet, of steel frame, costing $10,000.

DETROIT.—Studebaker Auto Co., H. R. Benson, vice president, is to build an assembling plant and repair shop to cost $18,000 at Portland, Ore.

KALAMAZOO, MICH. — Rex Paper Co., care Dan J. Albertson, architect, 305 East Main street, will take bids about July 10 on a boiler house, an engine room and paper mill.

LANSING, MICH.—Lansing State Bank, Mr. Larnerd, president, is planning to erect an 8-story building, 45 x 100 feet.

LANSING, MICH.—Atlas Drop Forging Co. is planning construction of a factory. Information may be obtained from Mt. Carpenter, care of the company.

MOHAWK, MICH.—Owners of the Mohawk copper mine will erect a complete electric power and lighting plant this summer. Electric underground haulage may be undertaken later.

PETOSKY, MICH.—Plans are being prepared for rebuilding the municipal electric light plant, J. W. Lovelace is manager.

LA CROSSE, WIS.—Plans have been completed by the Wisconsin-Minnesota Light & Power Co. for the construction of a new power station and rebuilding its central heating system at a cost of $210,000.

MILWAUKEE.—Articles of incorporation have been filed by the Whitney Foundation & Engineering Co., capital stock, $10,000. The incorporators are W. W., A. E., and E. A. Whitney.

MILWAUKEE.—Linde Air Products Co., New York, has been incorporated in Wisconsin with $25,000 capital stock and will establish a branch in Milwaukee, although no exact location has been fixed.

PORTAGE, WIS.—Portage Electric Light & Power Co., R. E. York, secretary, which has purchased the output of the Portage substation of the Southern Wisconsin Power Co., Madison, for $3,000 a year, has purchased the plant for $40,000 and will make extensive repairs.

PORTAGE, WIS.—Northwestern Storage Battery Co., Chicago, is negotiating with Portage capitial for the removal of the plant to this city on condition that a credit guaranty fund of $3,000 is provided. If the transfer is made, the name of the company will be changed to Petschel Storage Battery Co. William Petschel is president.

RACINE, WIS.—Milwaukee Electric Railway & Light Co., John Anderson, engineer, Milwaukee, is planning to erect a repair shop and car barn, two stories, costing $30,000, at Racine.

RACINE, WIS.—Tecktonius Mfg. Co. has plans drawn by D. R. Davis, architect, 527 Wisconsin street, for a 1-story factory, 40 x 108 feet, of brick and steel, sawtooth construction.

KANSAS CITY, MO.—J. A. McBride Mechanical Equipment Co. has been incorporated; $16,000 capital stock; by J. A. McBride, E. V. Sullivan and C. G. Van Horne

MARYSVILLE, MO.—The county court will erect two steel bridges, one a 30-foot span and the other a 16-foot span.

PANA, MO.—Pana Commercial club has subscribed $25,000 and a site for a $75,000 smelting plant, which will be moved from Sandovial, Ill., to Pana.

POPLAR BLUFF, MO.—City has plans for a power house, 50 x 122 feet. Fuller-Coult Co., Chemical building, St. Louis, is consulting engineer.

RICHMOND, MO.—Missouri Gas & Electric Service Co. will install an 18-foot x 72-inch horizontal tubular boiler. Otto McMahon is local manager.

SPRINGFIELD, MO.—Plans and estimates are asked for a central light and heating plant for the business district as contracts with the public service corporations expire this summer and if the cost is not too high a co-operative plant will be built.

ST. LOUIS.—Scullin-Gallagher Iron & Steel Co. is figuring on a large war contract.

ST. LOUIS.—Hanson Sheet Metal Co. will rebuild its burned plant at a cost of $30,000.

ST. LOUIS.—Aluminum Plaster Co. with $10,000 capital stock will build a plant at Twenty-ninth and Illinois avenues, St. Louis, to manufacture a patented plaster. This company is incorporated by the Aluminum Ore Co., C. B. Fox, general superintendent, 2916 McCausland avenue, St. Louis.

WASHINGTON, MO.—A. A. Tibbe is to build an electric power and heating plant including two St. Louis corliss engines, two Kewanee boilers and two Westinghouse generators.

BURLINGTON. IA.—An election will be held June 30 to vote on issuing bonds to help pay for a $200,000 bridge across the Mississippi river to be erected by the city and a stock company.

FAIRCHILD, IA. — Iowa Malleable Iron Co., P. V. Hughes, manager, Ninth and Kirkwood streets, is to build a plant of stone and concrete, 1 story, 50 x 100 feet.

FORT DODGE, IA.—Hawkeys Safety Appliance Co. has been incorporated; $10,000 capital stock; by F. E. Deuel, president; J. O. Harrison, vice president; D. V. Hitsman, treasurer and C. L. Tedrow, secretary.

IOWA CITY, IA. — Iowa City-Muscatine Interurban Railway Co. has completed surveys for its extension from Iowa City to Muscatine. A. L. Bowen of Muscatine is interested.

OSKALOOSA, IA.—August Gottschlick is planning an addition to his foundry.

SIOUX CITY, IA.—Plans are being prepared for an additional pumping plant and a centrifugal pump, etc. Phil. Carlin is superintendent.

WILTON, IA.—The city is to install additional generating machinery in its electric plant. David G. Fisher & Co., Davenport, are engineers.

ALBERT LEA.—Fred Tavis, county auditor, will take bids until July 12 on bridge No. 1814.

DULUTH, MINN.—Western Automobile Co. is having plans prepared by C. E. Nystrom, architect, for a $60,000 factory, 100 x 140 feet. C. E. Kling is interested.

DULUTH, MINN.—Gowan, Lenning, Brown Co., Fifth avenue, are having plans drawn for a 6-story warehouse, 160 x 260 feet. F. G. Germon, 401 American Exchange Bank is architect.

FOREST LAKE, MINN.—Citizens will vote shortly on issuing $20,000 in bonds for a water works system. J. F. Druar, Commerce building, St. Paul, is engineer.

MINNEAPOLIS.—The city has made application to the state railway commission for permission to erect a union municipal railway station at a cost of $16,000,000.

PALISADE, MINN.—It is proposed to erect a $9,000 bridge across the Mississippi river, of the lift type on concrete foundations. R. G. Sanford is town clerk.

ROBBINSDALE, MINN.—Plans are being made for a municipal water works plant including a power plant with 100,000-gallon, steel tank and tower and 10,000 feet of cast iron pipe. W. C. Buck is engineer, Fremont avenue south, Minneapolis.

SOUTHERN STATES

COVINGTON, VA.—City will receive bids until 1 p. m. July 12, for furnishing cast iron pipe, valves and other water works materials.

WAKE FOREST, N. C.—The city will vote July 27 on $10,000 bonds for electric light extensions.

ALCOLU, S. C.—Machine shop of D. W. Alderman & Sons Co. was badly damaged by fire.

CADWELL, GA.—City will vote July 8 on $3,000 bonds to improve water works, light plant and construct sewers.

BRADENTOWN, FLA.—This city will vote July 13 on $25,000 bonds for water works improvements.

ANNISTON, ALA.—Anniston Can & Machinery Co. has been organized by J. D. Mansfield and others to manufacture canning machinery.

FLORENCE, ALA.—Ashcraft Cotton Mills is to erect a 50,000-gallon, steel tank on a 75-foot, steel tower and is asking bids.

JACKSON, MISS. — Yazoo & Southern Railroad Co., recently incorporated at $3,000,000, will erect a railroad from Yazoo City to Carthage, Miss. Walter C. Murphy, Yazoo City, is one of the promoters.

MACON, MISS.—All Steel Motor Co. has bought the Blees Buggy Co. and will manufacture motor cars.

PHILADELPHIA, MISS.—Bonds for $30,000 have been voted for the purpose of building a water works plant; address the mayor.

YAZOO CITY, MISS.—Yazoo Southern Railroad, Walter C. Murphy, president, is planning to build 12 steel bridges having a total length of 1,400 feet.

DALLAS, TEX.—Texas Power & Light Co. is issuing $140,000 in bonds for extensions and improvements.

EL CAMPO, TEX.—Central Service Co., ice, electric light and power, has been incorporated; $200,000 capital stock; by P. J. Hardy, W. J. Hefner, E. L. Carrell and others.

ELGIN, TEX.—This city will vote July 16 on $11,000 bonds to construct waterworks.

FORT WORTH, TEX.—Ft. Worth Barrel Mfg. Co. is to erect a plant to manufacture oil tanks and barrels.

LITTLEFIELD, TEX.—Piasa Tractor Co., has been organized to build a plant at Virden, Tex., and will erect a factory, 50 x 100 feet, of structural and sheet steel and 50 workmen's cottages at a cost of $40,000. Machinery will be required for a light machine shop and the plant will make tractors, and gasoline engines up to 40 horsepower and other devices. M. S. Falmer of Littlefield, Tex., is president and manager.

WEATHERFORD, TEX. — Parker County will vote July 31, on issuing $65,000 in bonds for bridges and roads.

BATESVILLE, ARK.—J. W. Thompson is planning to erect a manganese smelter.

ENGLAND, ARK.—Henry Dusenbury, contractor, is seeking prices on steam or gasoline hoisting engines and equipment for 5-story work and a 3,000-pound load.

RUSH, ARK.—J. C. Sheppard Mining Co. is considering replacing its steam plant by a crude oil engine.

BELLBUCKLE, TENN.—A bond issue of $25,000 will be voted on next month for the installation of a water system.

BRAEMER, TENN.—Braemer Power Co. will construct a hydro-electric plant at Braemer Falls, on Laurel creek. W. P. Dungan is president and J. H. Graveson, manager.

CHATTANOOGA, TENN.—Southern Saddlery Co. has increased its capital stock from $25,000 to $100,000 and will erect a new addition for which machinery will be purchased.

COLUMBIA, TENN.—J. C. Parks will purchase refrigerator equipment and other machinery for a concrete abbatoir which he is about to erect.

HARRIMAN, TENN.—J. W. Watts will purchase power and special equipment for a new heading mill which he will establish. The concern will be incorporated shortly.

JACKSON, TENN.—Jackson Iron & Bronz Works, which plans to establish a foundry in connection with its ornamental iron plant, will increase its capital stock to $50,000.

KNOXVILLE, TENN.—American Zinc Co. has purchased a zinc property near New Market, Tenn., and will install a 400-ton ore mill.

LEBANON, TENN.—Charles Edwards, representing Chicago interests, has purchased a right of way for the construction of a traction line from Lebanon to Smithville, Tenn.

LONE MOUNTAIN, TENN.—Lone Mountain Milling Co. will purchase equipment for a cold storage plant.

MEMPHIS, TENN.—Gulf Refining Co. will purchase tanks for two gasoline stations to be established at a cost of $25,000.

MEMPHIS, TENN.—J. B. Sielstad, Front and Jefferson streets, is preparing plans for a machine shop, 80 x 125 feet, for the Dan Shea Boiler Works.

TULLAHOMA, TENN.—S. H. Brixey is building a garage and machine shop, and will be in the market shortly for equipment.

ANTLERS, OKLA.—This city has voted to install an electric light plant.

ELGIN, OKLA.—Elgin Threshing Machine Co. has been incorporated; $3,300 capital stock; by O. H. Putney, J. L. Brown and C. W. Compton.

EUFAULA, OKLA.—Missouri, Kansas & Texas railroad has authorized a 1,000-foot bridge over the Canadian river at Eufaula at a cost of $500,000.

HUGO, OKLA.—Hugo Ice & Light Co. is to spend $30,000 on enlargements, including a 500-kilowatt turbine and 400-horsepower boiler.

KEYSTONE, OKLA.—Keystone Bridge Co. has been incorporated $10,000 capital stock; by J. H. Woodward, J. M. Hildreth and S. R. Morris.

MARSHALL, OKLA.—Bonds for $5,000 have been voted to build an electric light plant.

MUSKOGEE, OKLA.—Rex Stove Co. has been incorporated; $10,000 capital stock; by James L. Powell, T. M. Yoho, Muskogee, and J. J. McDaniel, Columbus, O.

OKLAHOMA CITY.—Roy Hoffman is building a garage and repair shop requiring about $2,000 worth of equipment.

OKLAHOMA CITY.—Fred E. Sutton, Mid-Continent Co., Terminal building, and associates are to build an electric and gas plant. It is planned to use natural gas for fuel.

RANDLETT, OKLA. — Cedric Threshing Machine Co. has been incorporated to manufacture farming machinery; $12,000 capital stock; by J. W. Parker, S. J. Fender and J. W. Elmore.

TULSA, OKLA. — Tulsa county commissioners have adopted plans by Harrington, Howard & Ash, consulting engineers, Kansas City, Mo, for a bridge across the Arkansas river, 1465 feet long, with approaches 400 and 450 feet long and 30-foot roadway, to cost $183,000. Lewis Cline, county clerk.

TYRONE, OKLA.—Tyrone Light & Ice & Power Co., J. Harville, manager, recently incorporated, is to erect a 25 x 50-foot plant with capacity for 400 lights and a 3-ton ice factory.

VINETA, OKLA.—John A. Wise and H. E. Bagley are having plans prepared for a garage 100 x 150 feet.

WESTERN STATES

FARGO, N. D.—The water and light committee has recommended erection of a 300,000-gallon, steel tank on a 100-foot tower and the installation of a pump and additional mains to cost in all $24,000.

FARGO, N. D.—Union Light, Heat & Power Co. is to install two 1,500-kilowatt steam turbines, two water-tube boilers, a 3-unit motor generator set of 600 horsepower boiler fed pump, exciter, switchboard, etc. M. L. Hibbard is manager.

WILLISTON, N. D.—M. H. Aaen, auditor, is taking bids until July 16 on a quantity of bridge work.

DAVENPORT, NEB.—Bids will be asked soon for the construction of a municipal electric light plant. Charles F. Sturtevant, Holdrege, Neb., is consulting engineer.

GRAND ISLAND, NEB. — Grand Island Electric Co. has been given a permit by the state board of irrigation to construct a hydro-electric plant on the Platte river near Grand Island at a cost of $55,000. T. H. Fritts is secretary and manager.

MILLIGAN, NEB.—Contract will be let within 60 days for a water system costing $10,000. Martz Engineering Co., 416 First National Bank building, Lincoln, Neb., is engineer.

OMAHA, NEB. — Bankers Realty Investment Co. is contractor and architect for an 8-story hotel and apartment building, 90 x 190 feet, for the Blackton Holding Co. Structure will be erected of steel and brick at an estimated cost of $300,000.

KANSAS CITY, KAN.—County commissioners have approved plans for the Eighteenth street viaduct over the Union Pacific and Rock Island tracks at a cost of $136,000. William Barclay is city engineer.

IRON AND STEEL PRICES

Corrected up to Tuesday noon

PIG IRON

(Delivery to July 1.)

Bessemer, valley	$13.65 to 13.75
Bessemer, Pittsburgh	14.60 to 14.70
Basic, Pittsburgh	13.60 to 13.75
Basic, eastern Pa.	13.75 to 14.00
Malleable, Pittsburgh	13.45 to 13.95
Malleable foundry, Chicago	13.00
Malleable foundry, Philadelphia	15.00 to 15.25
Malleable foundry, Buffalo	12.50 to 13.00
No. 1X foundry, Philadelphia	14.50 to 14.75
No. 2 foundry, Pittsburgh	13.45 to 13.95
No. 2 foundry, valley	12.50 to 13.00
No. 2 foundry, Cleveland	13.00
No. 2 foundry, Ironton	12.50 to 12.75
No. 2 foundry, Chicago	13.00
No. 2X foundry, Philadelphia	14.25 to 14.50
No. 2X fdy., N. J. tidewater	14.25 to 14.50
No. 2X foundry, Buffalo	12.50 to 13.00
No. 2 plain, Philadelphia	14.00 to 14.25
No. 2 plain, N. J. tidewater	14.00 to 14.25
No. 2 plain, Buffalo	12.25 to 12.50
No. 2 southern, Birmingham	9.50 to 10.00
No. 1 southern, Cincinnati	12.40 to 12.90
No. 2 southern, Chicago	13.50 to 14.00
No. 2 southern, Phila. delivery	14.00 to 14.25
No. 2 southern, Cleveland	13.50 to 14.00
No. 2 south'n, New York docks	13.75 to 14.00
No. 2 southern Boston, docks	13.75 to 14.00
No. 2 south. interior, New Eng.	14.50 to 15.50
No. 2 southern, St. Louis	12.90 to 13.40
Virginia No. 2X furnace	12.50 to 13.00
Virginia 2X, Philadelphia	15.25
Virginia 2X, Jersey City	15.50
Virginia 2X, Boston points	15.75
Gray forge, eastern Pa.	13.25 to 13.50
Gray forge, Pittsburgh	13.20
Gray forge, Birmingham	8.75 to 9.00
Silveries, 8 per cent, Jackson, O.	14.75 to 15.25
Silveries, 5 per cent Birmingham	12.50
Silveries, 5 per cent, Chicago	16.35
Standard low phos., Phil.	20.00 to 21.00
Lebanon low phos., furnace	16.00 to 16.50
Low phos., Pittsburgh	20.95 to 21.20
Charcoal, Lake Superior, Chgo., Nos. 1 to 4	15.25 to 16.25
Charcoal, Buffalo	15.75 to 17.00
Charcoal, Birmingham	21.00

IRON ORE

Lake Superior Ores.

(Lower lake ports.)

Old range Bessemer, 55 per cent.	$3.75
Mesabi Bessemer, 55 per cent.	3.45
Old range, non-Bess., 51½ per cent.	3.00
Mesabi non-Bessemer, 51½ per cent.	2.80

FOREIGN ORES

(Per unit Philadelphia.)

(Prices nominal.)

Foreign Bess., 50 to 65 per cent.	8 to 8½c
For'n non-Bes., 50 to 65 per cent.	8 to 8½c

COKE

(At the ovens)

Connellsville furnace	$1.55 to 1.60
Connellsville fur. contr.	1.65 to 1.75
Connellsville furnace coke, fourth quarter	1.75
Connellsville foundry	2.00 to 2.40
Connellsville fdy. contr.	2.25 to 2.50
Wise county furnace	1.75 to 2.00
Wise county foundry	2.25 to 2.50
Pocahontas furnace	1.75 to 2.00
Pocahontas foundry	2.00 to 2.25
New River, foundry	2.50 to 3.00
New River, furnace	2.00 to 2.25

FERRO-ALLOYS

Ferro mang. furnace (prompt)	$100 to 115
Ferro mang. Balti. (future)	100.00
Ferro-silicon, 50 per cent, Pbgh.	71.00 to 73.00
Ferro-silicon, 50 per cent, Phila.	71.00 to 73.00
Ferro-sil., 12 to 13 per cent.	18.00 to 18.50
Ferro-sil., 11 to 12 per cent.	17.00 to 17.50
Ferro-sil., 10 to 11 per cent.	16.00 to 16.50
Ferro-sil., 9 to 10 per cent.	15.00 to 15.50

(Ferro-silicon quoted at furnace Ashland, Jackson and New Straitsville.)

Ferro-carbon titanium, carloads, per lb.	8c to 12½c

SEMI-FINISHED STEEL

Open hearth billets, Phila.	$22.06 to 22.56
Forging billets, Phila.	24.56 to 25.06
Forging billets, Pbgh.	27.00

Freight Rates via Panama Canal

Rates on finished materials, including plates, shapes, bars, wire, nails, etc., to Pacific coast points via Panama canal, per 100 lbs., in carload lots, exclusive of insurance and dockage.

From New York	$0.45
From Pittsburgh	.619
From Youngstown	.639
From Niles	.619
From Wheeling	.619
From Steubenville	.619
From Johnstown	.604
From Coatesville	.545
From Steelton	.555
From Bethlehem	.529
From Cleveland	.65
From Chicago	.765

Wire rods, Pittsburgh	$25.00 to 26.00
Billets, Pittsburgh	20.50 to 21.00
Billets, Youngstown	19.50 to 20.50
Sheet bars, Pittsburgh	21.50 to 22.00
Sheet bars, Youngstown	20.50 to 21.00
Muck bar, Pittsburgh	27.00

RAILS AND TRACK MATERIAL

Stand. Bess., rails, Pbgh.	1.25c
Stand. open-hearth rails, Pbgh.	1.34c
Lgt. rails, 8-lbs., Pbgh. & Chgo.	1.22c
Lgt. rails, 12 lbs. Pbg. & Chgo.	1.17c
Lgt. rails, 16 to 20 lbs., Pgh. & Chgo.	1.12c
Lgt. rails, 25 to 45 lbs., Pbgh. and Chgo.	1.07c
Relaying rails, standard, Pbg. & Chgo.	$23.00 to 24.00
Relaying rails, light, Chgo.	21.50 to 22.50
Angle bars, st. sect. Pbgh. base.	1.50c
Angle bars, st. sections, Chicago	1.50c
Spikes, railroad, Pbgh.	1.40c
Spikes, railroad, Chgo.	1.50c
Track bolts, Pbgh.	1.95c to 2.00c
Track bolts, Chgo.	2.00c

Freight Rates, Pig Iron

Mahoning and Shenango valleys to:—

Cleveland	$0.95
Newark, N. J.	3.00
New England	3.00
Philadelphia	2.79
Pittsburgh	.95
St. Louis	3.18

Buffalo to:—

Albany, N. Y.	$1.26
New England (all rail)	2.58
New York and Brooklyn (all rail)	2.58
New York and Brooklyn (by canal)	1.00 to 1.50

Virginia furnaces to:—

Boston docks (r. and w.)	$3.05
New England (all rail)	3.25
New York dock (r. and w.)	2.88

Birmingham, Ala., to:—

Cincinnati	$2.90
Chicago	4.00
Cleveland	4.00
Louisville, Ky.	2.65
New York (all rail)	6.15
New York (rail and water)	4.25
Philadelphia (all rail)	5.20
Philadelphia (rail and water)	4.00
Pittsburgh	4.90
Savannah, Ga.	2.75

Chicago, to:—

Des Moines	$2.80
Milwaukee	.50
Moline, Ill.	1.47
Omaha	3.58
St. Louis	1.58

Ironton and Jackson, O., to:—

Chicago	$2.54
Cincinnati	1.26
Cleveland	1.62
Detroit	1.81
Indianapolis	1.58

SHAPES, PLATES AND BARS

Structural shapes, Pittsburgh	1.25c
Structural shapes, Chicago	1.44c
Structural shapes, Philadelphia	1.369c to 1.419c
Structural shapes, New York	1.359c to 1.409c
Struc. shapes, San Francisco	2.00c to 2.05c
Tank plates, Chicago	1.34c to 1.44c
Tank plates, Pittsburgh	1.20c to 1.25c
Tank plates, Philadelphia	1.359c to 1.409c
Tank plates, New York	1.369c to 1.419c
Bars, soft steel, Pittsburgh	1.25c
Bars, soft steel, Chicago	1.44c
Bars, soft steel, Philadelphia	1.309c to 1.409c
Bars, soft steel, New York	1.319c to 1.419c
Hoops, carloads, Pittsburgh	1.25c to 1.30c
Bands, Pittsburgh	1.25c
Shafting, Pbgh., contr.	66 to 68 per cent off
Screw stks., Pgh. carl'ds,	68 to 70 per cent off
Bar iron, Chicago	1.20c
Bar iron, Philadelphia	1.175c to 1.225c
Bar iron, New York	1.15c to 1.20c
Bar iron, Cleveland	1.20c to 1.25c
Bar iron, Pittsburgh	1.25c
Hard steel bars, Chicago	1.20c to 1.25c
Smooth finish, mchy. steel, Chi.	1.68c

SHEETS AND TIN PLATE

No. 28, black, Pittsburgh	1.80c
No. 28, black, Chicago	1.89c to 1.94c
No. 28, tin mill, black, Pbgh.	1.85c to 1.90c
No. 28, galvanized, Pbgh. (nom.)	5.00c to 6.00c
No. 28, galvanized, Chgo., nom	
No. 10, blue, anld., Pbgh. nom.	1.35c
No. 10, blue, annealed, Phila.	1.509c to 1.559c
Tin plate, 100 lb., coke base	3.10c to 3.20c

EXTRAS FOR SHEET OR TIN MILL SPECIFICATIONS

(Per hundred pounds.)

Single pickled, cold roll, and re-anl.	30 cents
Hot roll'd pickl'd and anl., tin mill	25 cents
Full pickl'd, cold rolled and re-anl.	50 cents
Auto sheets	75 cents
Blued stove pipe stock	10 cents
Range steel	30 cents
Re-squaring	10 cents
Roller leveling	10 cents
Patent leveling and re-squaring	35 cents
Oiling sheets	10 cents
Deoxidizing	10 cents
Lime finish	10 cents
Open-hearth stamping steel, free from mill scale	55 cents
Special open hearth deep stpg. steel free from mill scale	80 cents
Extra deep special auto body stock	$1.25
Ext. for 28 gage ov. 32 to 36-in. wide	10 cents

No reduction for sheets not annealed.

The above extras apply on both sheet and tin mill specifications, at the same rate.

IRON AND STEEL PIPE

(Pittsburgh.)

	Black. Butt-weld.	Galv. Butt-weld.
Steel, ⅜ to 3 inches	79	57½
Iron, ⅜ to 2½ inches	71	46
	Lap-weld.	
Steel, 2½ to 6 inches	78	62½

BOILER TUBES

Steel, 3½ to 4½ inches l. c. l.	73
Iron, 3½ to 4½ inches l. c. l.	61

WIRE PRODUCTS

(Retailers' price 5 cents above jobbers' quotation.)

Wire nails jobbers, Pittsburgh	$1.55 to 1.60
Plain wire, jobbers, Pittsburgh	1.35 to 1.40
Galvanized wire, jobbers, Pbgh.	2.15 to 2.20
Polished staples, Pbgh.	1.55 to 1.60
Galvanized staples, Pbgh.	2.35 to 2.40
Barb wire, painted, jobbers, Pbgh.	1.55 to 1.60
Barb wire, galv., jobbers, Pbgh.	2.35 to 2.40